Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

http://www.archive.org/details/canadianmachv14n05torouoft

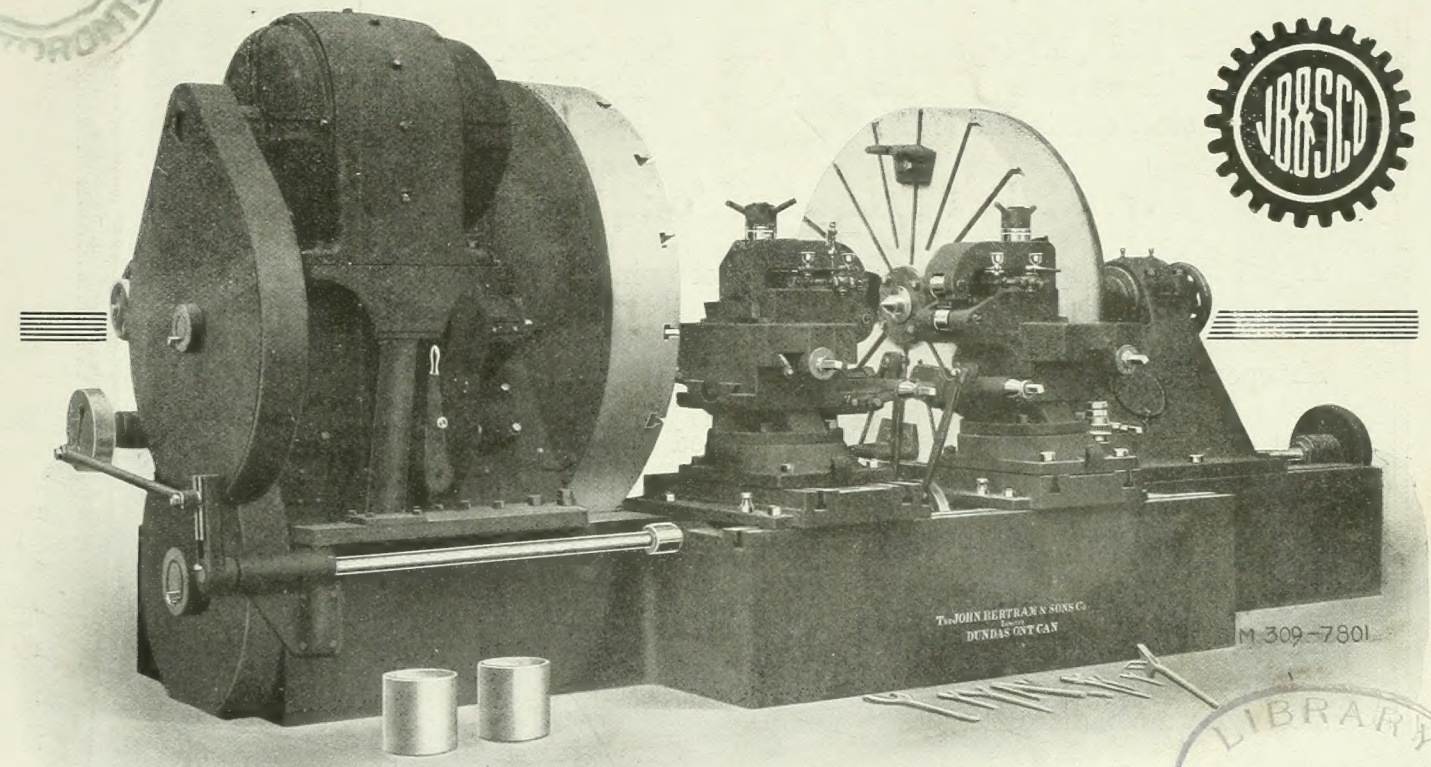
CIRCULATES IN EVERY PROVINCE IN CANADA.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by the MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XIV | Publication Office: Toronto, July 29, 1915 | No. 5

Librarian Univ. of Toronto, Engl. Bldg. Rec. of S.



LIBRARY
JUN 16 1922
UNIVERSITY OF TORONTO

BERTRAM 80-in. Motor-Driven Extra Heavy Driving Wheel Chucking Lathe

JB&SCo

One of our large line of heavy tools for Locomotive and Car Shops. Equipped with Teas Patent Sure-Grip Drivers and Pneumatic Tool Clamps. Movement of tail stocks by motor.

Drop us a line for full particulars.

The John Bertram & Sons Co., Ltd.

Dundas, Ontario, Canada

MONTREAL
723 Drummond Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

Why P. & W. Taps Win

It's in the Design

One-third of the land from the cutting edge is concentric.

The remaining two-thirds has eccentric relief.

The taper-tap has a cylindrical pilot.

The taper and plug-taps have an eccentrically relieved chamfer relieved clear from the cutting edge. The highest grade of steel obtainable is used.

What It Means to You

Taps can be sharpened at the only correct point—on the face of the cutting edge.

Sharpening in no way affects their size.

Can be sharpened long after other so-called eccentrically relieved taps are rendered useless.

We obtain the freest cutting tap with the longest life—an exclusive combination.

Accuracy nowhere else obtainable is secured, together with a degree of finish and refinement heretofore thought impossible with a commercial tool.

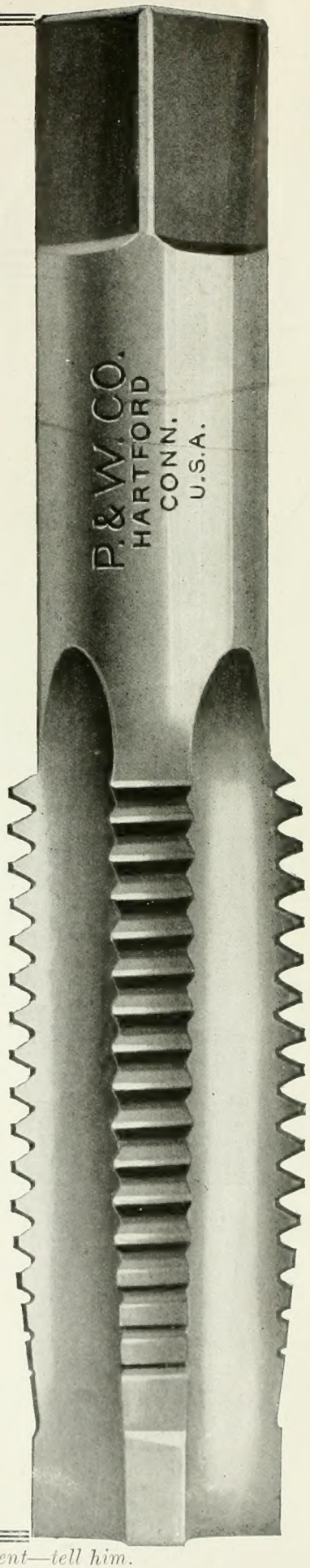
For a number of years we have made taps with this style of relief. They have won out steadily and consistently on merit alone.

The Tap with the

(Trade-Mark)

Con-eccentric Land

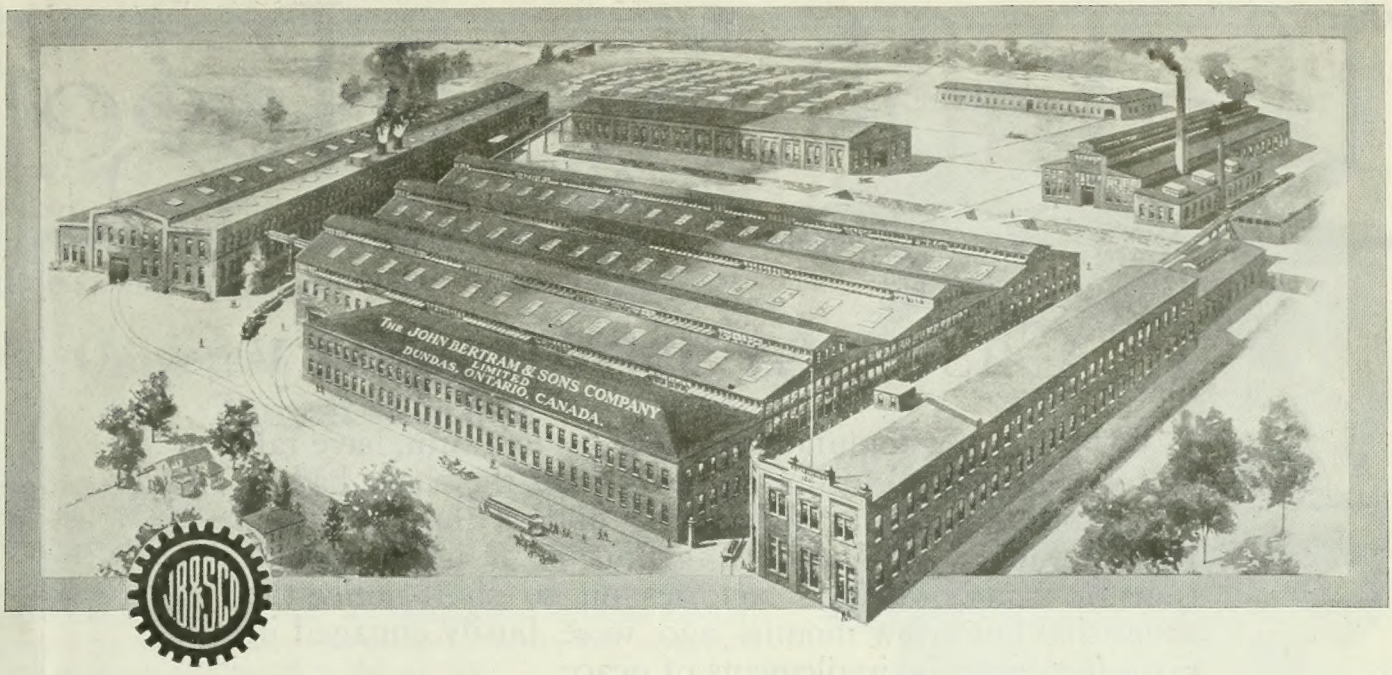
(Registered U.S. Patent Office)



Pratt & Whitney Company of Canada, Limited

DUNDAS	MONTREAL	WINNIPEG	VANCOUVER
Ontario	723 Drummond Bldg.	Bank of Hamilton Bldg.	B.C. Equipment Co.

The advertiser would like to know where you saw his advertisement—tell him.



THE PLANT BEHIND

BERTRAM MACHINE TOOLS

60 years ago McKechnie and Bertram manufactured the first machine tools ever made in Canada on a commercial basis.

Look at the immense proportions of the plant to-day!—and it is still producing Canada's leading tools.

Our record is your security.

No concern could make such a wonderful advance unless its products and its reputation were good. Over half a century of *building in quality, service* and *square dealing* stand behind every BERTRAM MACHINE TOOL.

Our up-to-date engineering organization will gladly give you honest advice as to what machine tool is best for your needs.

Drop us a line to-day.

The John Bertram & Sons Co., Ltd.

Dundas, Ontario, Canada

MONTREAL
723 Drummond Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

The Publisher's Page

By B.G.N.

In Cases of Emergency

CANADIAN manufacturers, almost to a firm, have rallied to the call for munitions. True, they have had to overcome stupendous difficulties, and it has required resourcefulness and inventive genius of a high order to transform into ordnance factories on so short notice the shops that but a few months ago were busily engaged in manufacturing the implements of peace.

¶ There was need of all possible information on the subject of shell making, and it has been a source of satisfaction to our Canadian manufacturers that they had in their midst a technical journal that was editorially equipped, and enterprising enough to *promptly* give the subject the *expert* attention it deserved.

CANADIAN MACHINERY

through its articles on shell manufacture, has not only enhanced its reputation as an exceedingly useful paper in its own most important field, but has attracted attention from all over Great Britain and the United States as well.

¶ Technical publications like CANADIAN MACHINERY not only enable their readers to meet emergencies as they arise, but help them to prepare for them in advance. They deal in a practical way with the problems of manufacturers and their shop executives.

¶ And as modern efficiency in modern plants concerns machinery as well as men, it is only natural that the advertising pages of reputable publications should be as freely consulted as the editorial departments.

¶ For this reason CANADIAN MACHINERY ranks high as a business producer for its advertisers.

¶ It has the circulation both as concerns quality and quantity. It commands the respect and consequently the **studious** attention of its subscribers. Perhaps it can serve you as successfully as it does others?

Rate card and full particulars about our Service Department upon request.

Canadian Machinery and Mfg. News

143-153 UNIVERSITY AVE. TORONTO, ONTARIO

Two Cuts at One Time

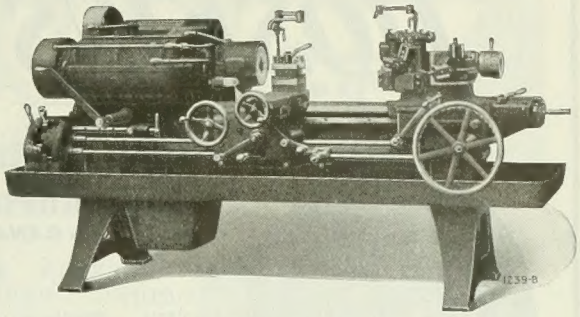
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

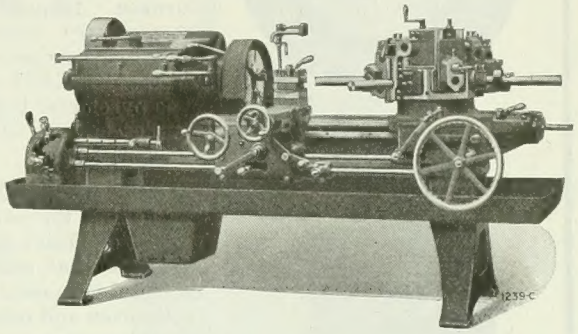
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



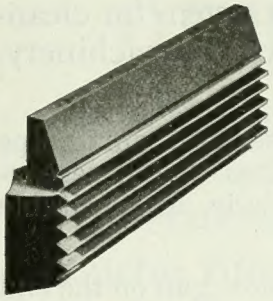
No. 2-A—With "Bar Equipment"



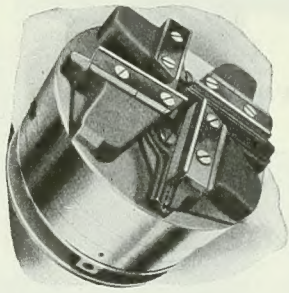
No. 2-A—With "Chucking Equipment"

THE WARNER & SWASEY CO., Cleveland, Ohio, U. S. A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal.



In Scientific Selection The Landis Die Predominates



Because,—

The length of the chasers increases its life from ten to twenty times that of the hobbed die.

The line contact the chasers have with the work minimizes the friction at the cutting edges and permits of a much higher cutting speed.

Of the interchangeability of the chasers, which means any one or more of a set can be replaced without renewing the entire die.

Of the right and left hand threading with the same set of dies, a feature accomplished by grinding the opposite ends of the chasers and using right and left hand chaser holders.

Of the uniform hardness of the chasers, which makes it unnecessary to anneal, hob or retemper the die.

WRITE FOR CATALOGUE NO. 21

LANDIS MACHINE COMPANY, Incorporated

WAYNESBORO, PA., U.S.A.

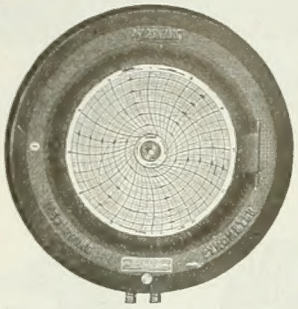
Exclusive Canadian Agents:—Williams & Wilson, Limited, Montreal, Canada

HOSKINS

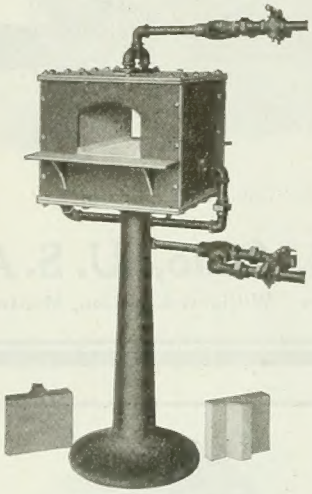
TRADE MARK REGISTERED

Heat-Treating Equipment

MADE-IN-CANADA



A HOSKINS RECORDING PYROMETER will give you a printed record of your furnace temperature. A necessary check on your furnace operators. THE HOSKINS new type pyrometer thermocouples have a GUARANTEED life.



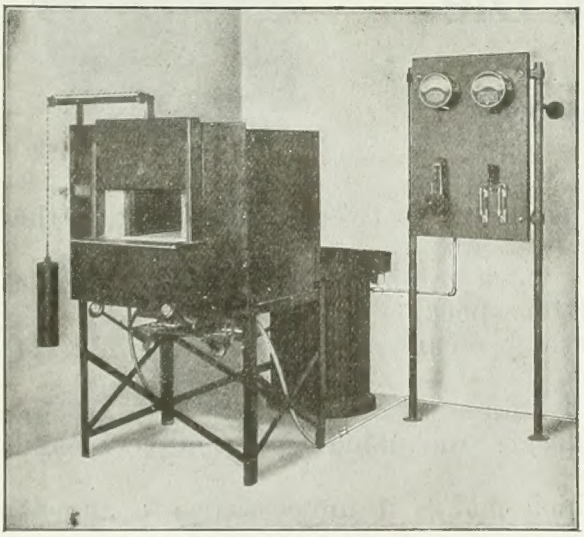
Electric Baking Ovens for baking the varnish in high explosive shells. Accurate heat control; no injurious gases; perfectly even and unvarying temperature. Write for blueprints and particulars.

Gas and Oil Furnaces for all forms of case-hardening, annealing, lead pots and barium baths.

Maximum Tool Efficiency

Hoskins Electric, Gas and Oil Furnaces for tool hardening, assure the greatest life from your tools.

No. 51 TOOL FURNACE FOR GAS



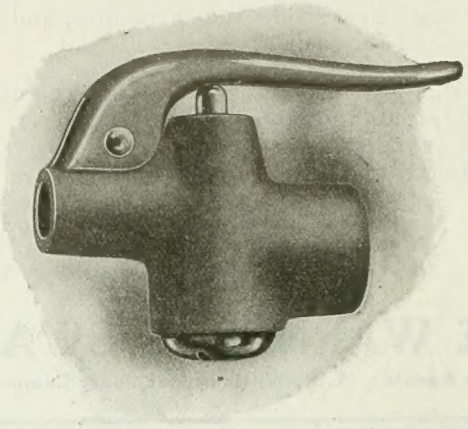
TYPE F. C. ELECTRIC FURNACE FOR HARDENING HIGH-SPEED STEEL TOOLS

Canadian Hoskins Limited

Electric, Gas and Oil Furnaces and Pyrometers

Walkerville, Ontario

CLEAN WITH AIR



At slight cost a whole shop may be equipped with a system for cleaning inaccessible parts of machinery, tools, patterns, etc.

If air is available a series of small pipe lines may be placed so that hose connections can be made at desirable points.

Put an "Imperial" blow gun on the end of each length of hose and do away with the necessity of opening and closing a globe valve. The gun will not leak.

"One blast will clean a drilled hole."

Get one for experimental purposes. It will pay.

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

Montreal, Canada

Sydney Toronto Cobalt Timmins Winnipeg
Nelson Vancouver

1836 SOUTHWARK 1915
HYDRAULIC MACHINERY

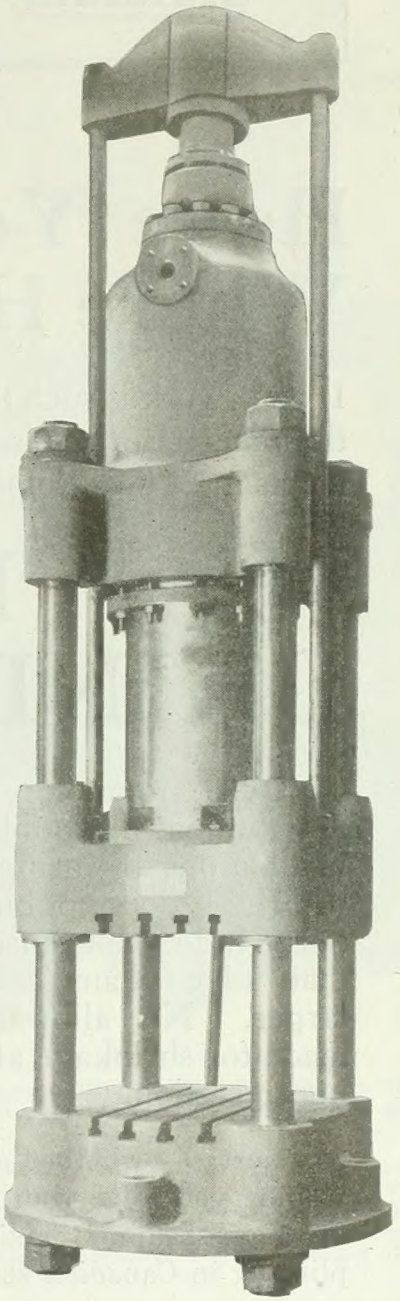
HYDRAULIC EQUIPMENT

FOR ALL PURPOSES

Presses	Pumps
Riveters	Accumulators
Cranes	Hoists
Intensifiers	Jacks
Leather Packings	Pipe Fittings
Gauges	Valves
Etc.,	Etc.

OTHER PRODUCTS

Centrifugal Pumps.
Turbo Generators for Direct and Alternating Current.
Turbo Blowers.
Turbo Pumps.
Surface and Jet Condensers with their Auxiliaries.
Southwark-Harris Valveless Oil Engine.



3,000 ton Piercing and Forging Press

Southwark Foundry & Machine Company
PHILADELPHIA
Founded 1836
Old Colony Building, Chicago
Brown-Marx Building, Birmingham
"First Builders of Large Centrifugal Pumps in America."

Have You a Grinding Job Where Heat Makes Trouble?

If your work is such that any increase in heat will change the character of the material, or if it is such that limits are exceedingly close and measurements must be absolute, you will not go wrong in using

NORTON GRINDING WHEELS

One electric motor manufacturer has eliminated trouble in grinding laminations by using a *Crystolon* wheel. It does not burn the insulation. It does not cause expansion so that the diameter micrometers larger. No allowance need be made for shrinkage after the grinding operation.

Another motor builder grinds soft steel laminations with an *Alundum* wheel. In this case the presence of shellac on the work makes it necessary to dress the wheel every three pieces, but a report on this operation says: "Life of wheel is longer, production better and cutting action the best ever."

Our service—whether advisory or experimental—may be worth much to you in helping you solve your grinding problems. If your problem is one of big production—shrapnel or similar material—let us tell you what Alundum is accomplishing in Canadian shops.

NORTON COMPANY

WORCESTER, MASS., U.S.A.

Canadian Agents:

THE CANADIAN FAIRBANKS-MORSE CO., LTD.

Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria.

F. H. ANDREWS & SON, Quebec, P. Q. 725

The advertiser would like to know where you saw his advertisement—tell him.

"MODERN"

12" x 24" Self-Contained

GRINDING MACHINE

GRINDING SHRAPNEL SHELLS

We have recently sold a large number of these machines in Canada, completely equipped for Shrapnel Work. Their heavy, rigid construction makes them very desirable for shell work or on any production where speed and accuracy are very essential.

Absolute central control—all levers and hand wheels concentrated on front of machine quickly and easily operated. Work speeds and table feeds entirely independent and cover every range within the capacity of the machine. These are derived from our patented single-unit speed-change mechanism. Automatic feed at either or both ends of table reverse. Auxiliary feed for bringing wheel into work without traversing table. Positive stop provided when feeding wheel by hand. Steady rests that are universal in all their movements and have positive stops for grinding duplicate work. Interchangeable wheel centers.

Large diameter wheel with wide face.

Our patented speed-change gear box allows for 12 work speeds and 6 table feeds. All gears are in mesh at all times.

Equipped for all classes of straight and taper cylindrical work.

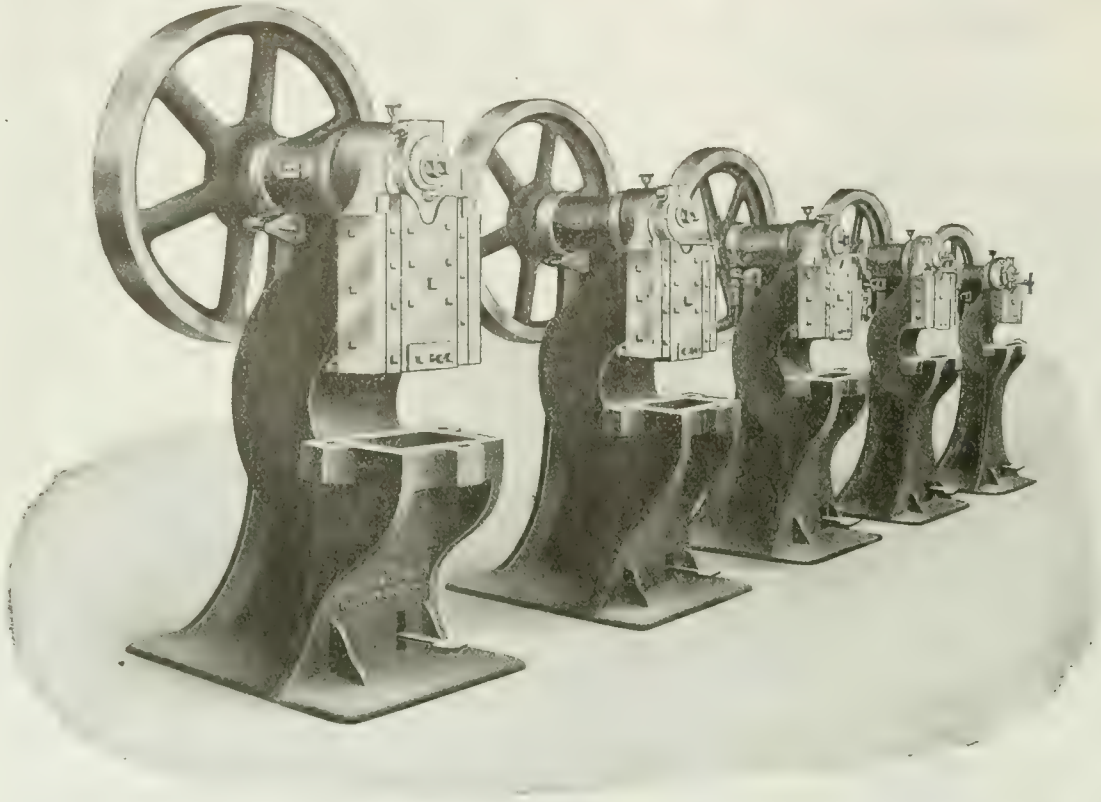
Send for blueprints and estimates.

Modern Tool Company

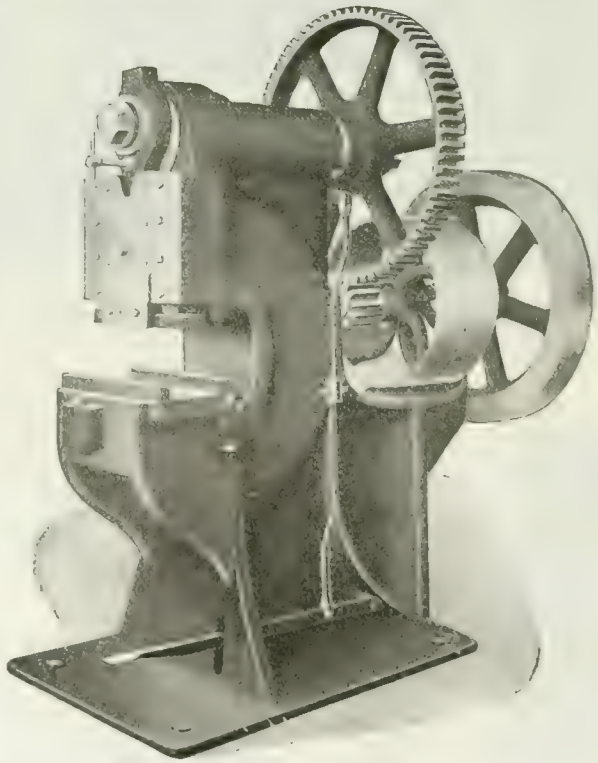
Main Office and Works: State and Peach Streets, Erie, Penn'a

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal

"PRESS SUPERIORITY"



If you will give the "BB" Press a trial, it will prove conclusively its superiority. Its economic principles are a plea to your good judgment. Its careful construction, well-made parts, finish and accuracy are impressive proof of the "BB" art of press building.



Our "G.A." Power Punching Presses are adapted for nearly every kind of **Blank Cutting, Punching, Perforating, Forming and Bending,** including a large portion of operations needed in the manufacture of Bicycles, Locks, Cutlery, etc., etc. These presses are also equipped with **Graduated Adjustment,** which is especially valuable in the re-setting of different dies.

WE WANT YOU TO GET ACQUAINTED WITH THE "BB" QUALITY. WRITE FOR CATALOGUE AND PRICES.

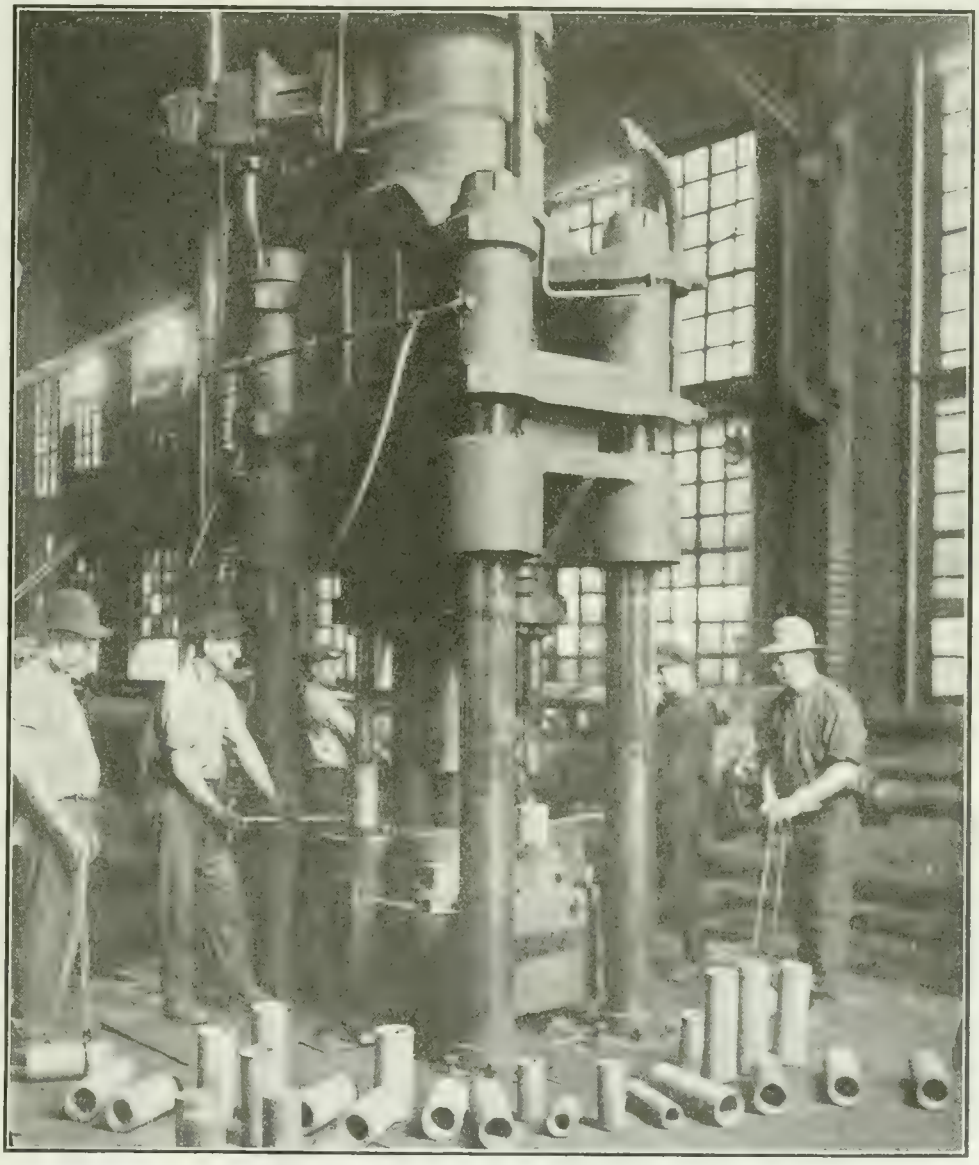
THE BROWN BOGGS CO., LIMITED, Hamilton, Canada

Tinsmith Tools, Sheet Metal Working Machinery, Dies, Presses, Etc.

WESTERN REPRESENTATIVES:

MESSRS. BISSETT & WEBB, LIMITED, Winnipeg and Edmonton

PURELY HYDRAULIC
"Extra Rapid" Forging Presses

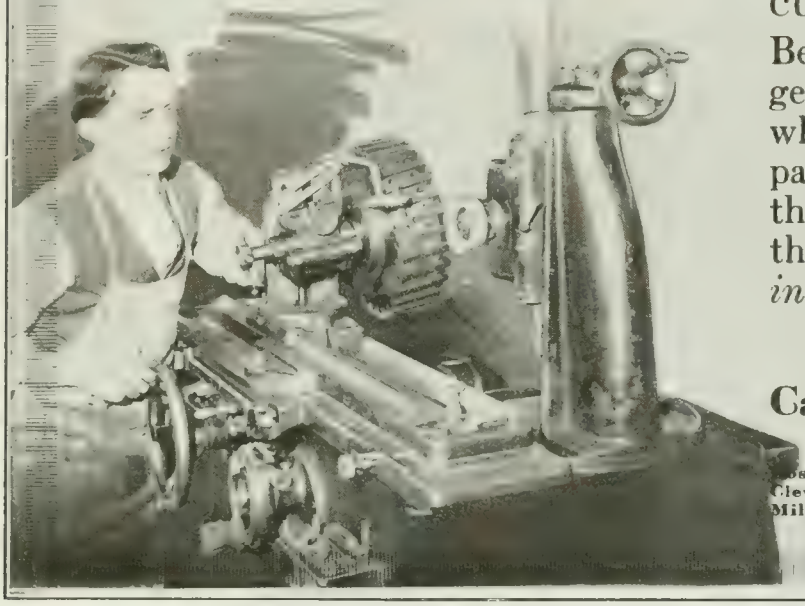


Purely Hydraulic Tod Presses for Piercing and Drawing of Shells and Projectiles
WE CAN SUPPLY FORGED SHELL BLANKS UP TO 8 in. DIAMETER

The William Tod Company
YOUNGSTOWN, OHIO

ENGINES—Mill, Reversing, Blowing, Gas, Pumping
ROLLING MILLS—CONDENSERS—HYDRAULIC FORGING PRESSES, IRON AND BRASS CASTINGS

For Example, Take the Work of Grinding Cutters



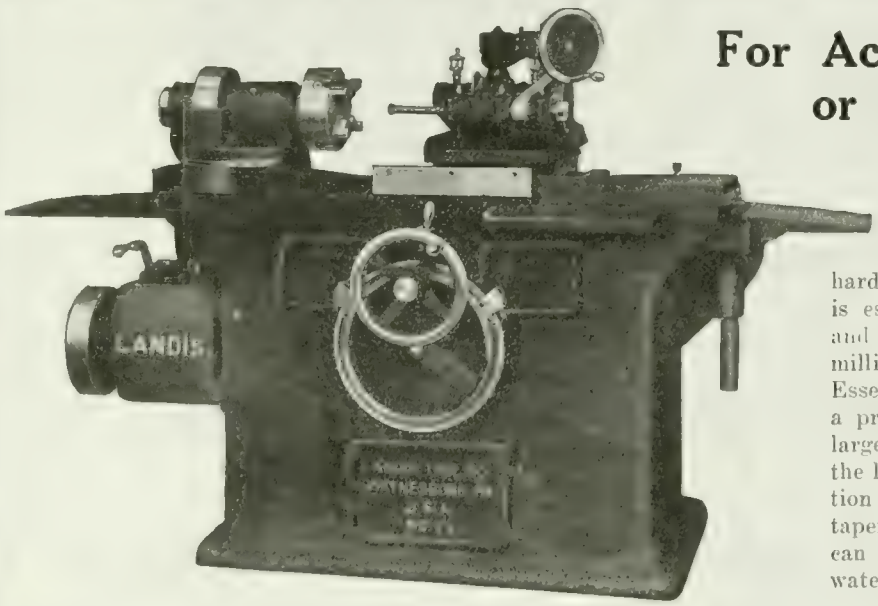
It calls for a wheel that will cut clean and fast and positively cool—a wheel that will hold its shape so as to insure accuracy.

Be certain, therefore, that you get an Aloxite wheel—the wheel for steel. Our service department will see to it that the grit and grade are right—that you get *the Right Wheel in the Right Place.*

The Carborundum Company
Niagara Falls, N. Y.

Boston New York Philadelphia Pittsburgh
Cleveland Cincinnati Grand Rapids Chicago
Milwaukee Manchester, Eng. Reisholz, Ger.

LANDIS INTERNAL GRINDING MACHINE



For Accurate, Straight or Taper Holes

Accuracy, fine finish and the greatest economy is insured with the **LANDIS Internal Grinder.** Designed for straight or taper grinding, it handles hard or soft material with equal facility, is especially adapted to automobile work, and for finishing holes in such parts as milling cutters, reamers, bushings, dies, etc. Essentially a manufacturing machine, it is a profit-bringer whether used for work in large or small quantities. It is accurate to the last degree, especially rigid in construction and handy in operation. For grinding taper, both table and work carrying head can be swiveled. Special collet chuck and water attachment can be supplied.

Special Internal Grinding Machine Circular on Request.

LANDIS TOOL COMPANY

Main Office and Works:
WAYNESBORO, PA., U. S. A.

Manufacturers of Grinding Machines for Cylindrical and Conical Surfaces

Universal Grinding Machines
Plain Grinding Machines
Roll Grinding Machines
Crank Grinding Machines
Internal Grinding Machines
Cam Grinding Machines

Canadian Agents—A. R. Williams Machinery Co., Toronto ; Williams & Wilson, Montreal

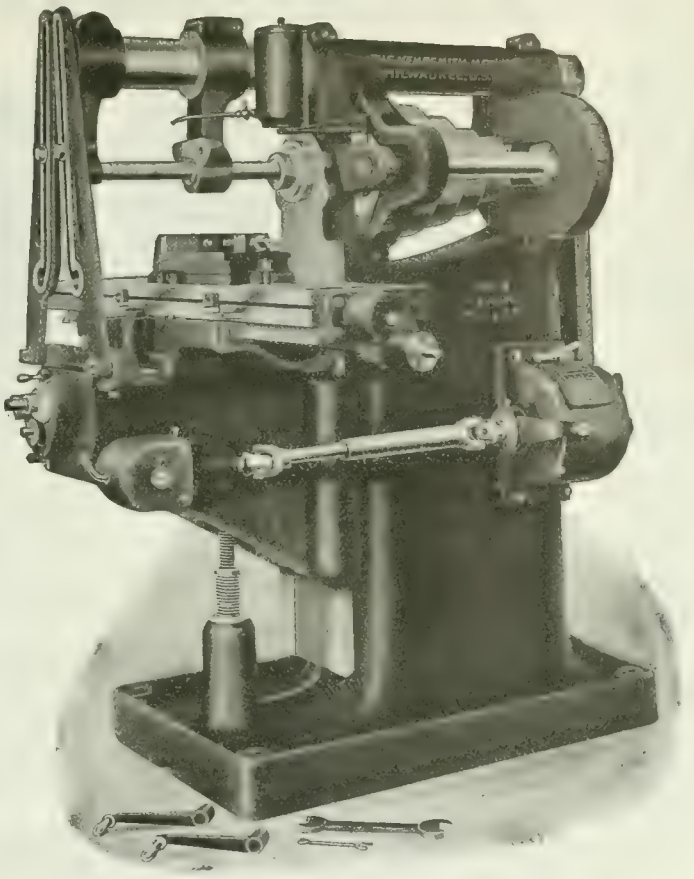
KEMPSMITH
PLAIN MILLERS

Built in Four Sizes Knee Type
Two Sizes Lincoln Type

These milling machines are characterized by simplicity of operation, rigidity of design and highest accuracy in construction.

Our literature on the construction and use of Milling Machines will be found interesting and suggestive. Sent gladly on request.

KEMPSMITH MFG. COMPANY
MILWAUKEE, WIS.



A MODERN SAVER
of Time, Money, Space and Labor

Here is a machine that is well worthy of your attention—our **"Double C Punch and Shear"** with 48-inch throat.

This machine has an enormous capacity for doing **rapid, accurate** and **economical** work of **quality**.

Let us send full description. If you are interested in up-to-date money-saving machinery you cannot afford to remain uninformed.

We manufacture a complete line of

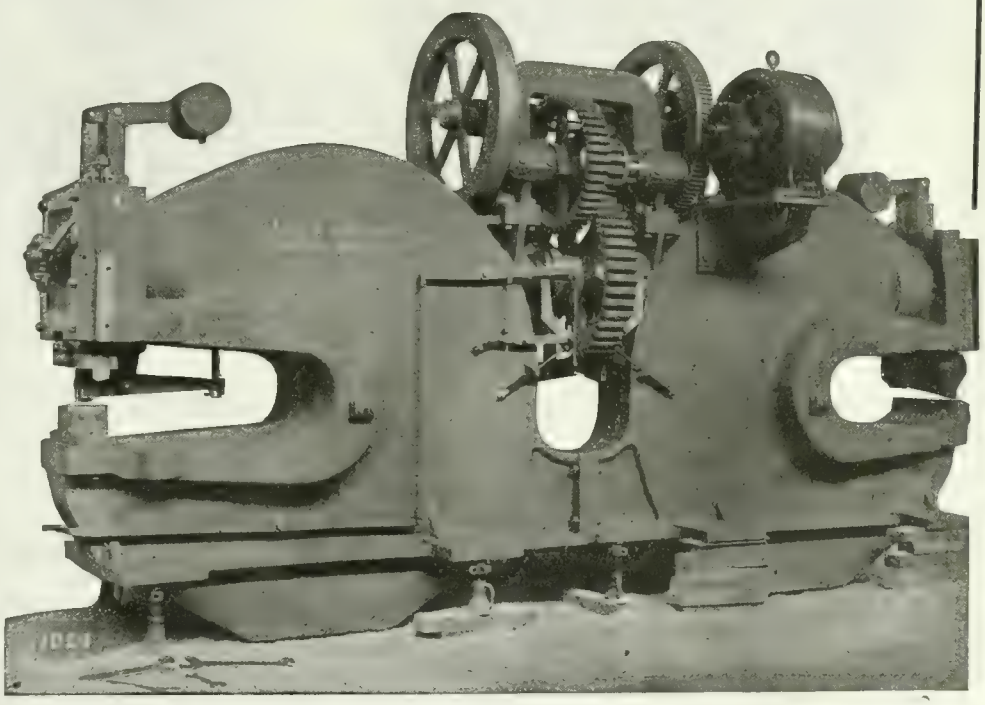
LABOR-SAVING MACHINERY

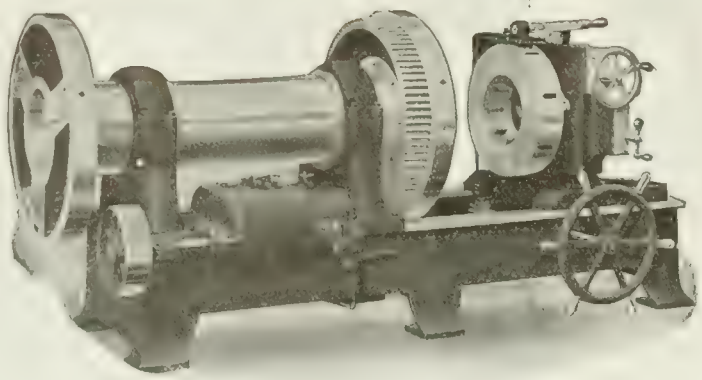
all kinds and sizes, for

Structural Iron Works, Railroad and Locomotive Shops, Boiler Shops, Rolling Mills, Agricultural Implement and Plow Shops, etc.

The Long & Allstatter Co.
HAMILTON, OHIO

Canadian Representatives
RUDEL-BELNAP CO.
Montreal, P.Q. Toronto, Ont.





Up to a Standard

All our years of machinery manufacturing experience has been concentrated on pipe-threading machines. We have built long life and supreme satisfaction to pipe machine users in every machine we turned out. The machines are built up to a standard, not down to a price. Convenience and safety of the operator are a part of the general design.

Send for the catalog of these "up to a standard" machines.

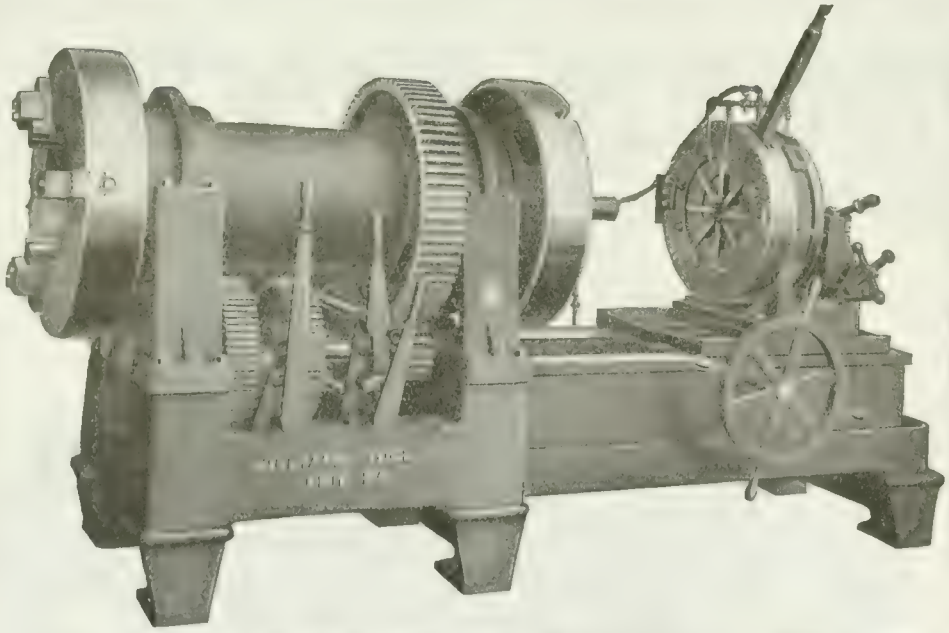
Bignall & Keeler Machine Works, **Edwardsville, Ill.**

The Canadian Fairbanks-Morse Co., Ltd.

Sales Agents for Canada

Montreal St. John Toronto Winnipeg Calgary Saskatoon Vancouver

Canada's Departmental House for Mechanical Goods



The gas light was a big improvement over the tallow dip, but it had to give way to the electric light; and the Tungsten has superseded the little glimmer that once delighted us.

If you are still employing pipe-cutting methods as antiquated as the tallow dip, you need a Williams Pipe Machine, which occupies the same position in the pipe-cutting field as the Tungsten does in the lighting world, to bring you up-to-date.

Let us quote you prices and terms: any machine to cut 10 sizes of pipe between 1-4 inch and 18 inch, with any kind of power.

Anyone making, selling or buying a pipe machine, claimed to be a Canadian-made Williams Pipe Machine, does so without right or authority from us, and is liable to prosecution for damages.

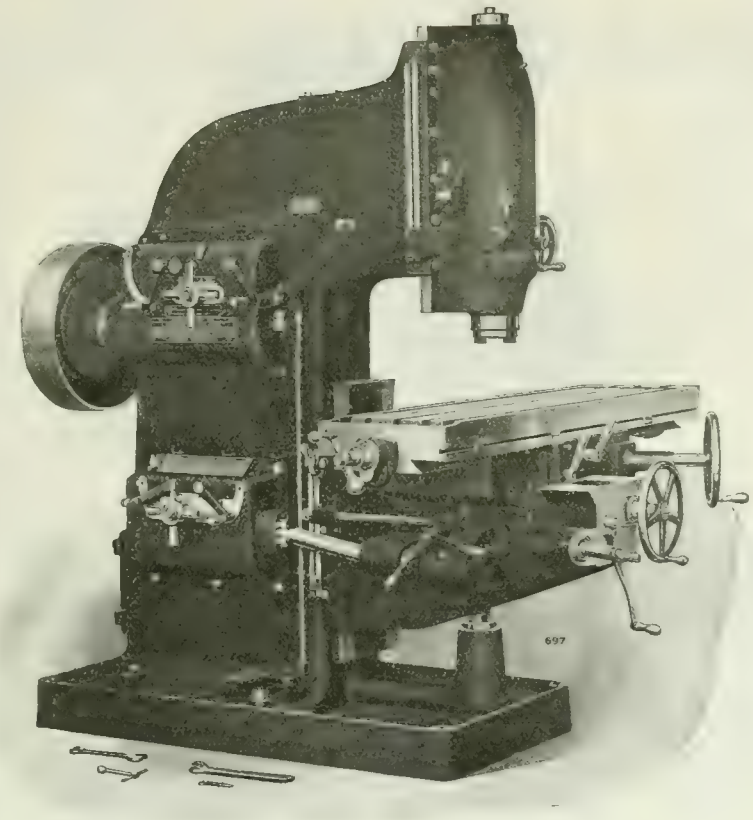
Williams Tool Co., Erie, Pa., U.S.A.

AGENTS:

A. R. WILLIAMS MACHINERY COMPANY

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

The advertiser would like to know where you saw his advertisement—tell him.



High Power Vertical
Cincinnati Millers

are made in three sizes—28″, 34″, and 42″ table travel, and of 5 h. p., 7½ h. p. and 10 h. p., respectively.

Heat Treated Alloy Steel Gearing; locked tumbler; single plunger trip; feed levers control reverse and always indicate which way the table will move; sight feed oilers. **THE SPINDLE HEAD** is made in large proportions—see illustration; head can be securely bolted to the column when doing heavy milling. **THE DRIVE** is always through the main gear close to the lower bearing. **THE SPINDLE BEARINGS** are always the maximum distance apart.

The Spindle has a flanged end and uses the same face mills that fit twenty-two different Cincinnati Millers.

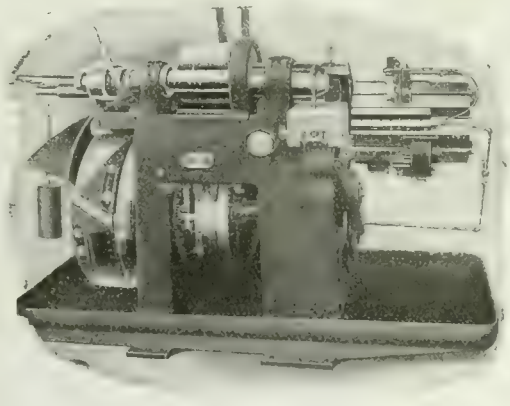
The No. 4 is furnished with our improved **POWER QUICK RETURN.**

Because of all these features these machines have greater capacity than other Verticals of equivalent size.

The Cincinnati Milling Machine Co.
Cincinnati, Ohio.

Canadian Agents: H. W. Petrie, Ltd., Toronto, Ont.
H. W. Petrie of Montreal, Ltd., Montreal, Que.
Taylor Engineering Co., Ltd., Vancouver, B. C.

"GRIDLEY" Single SPINDLE



—*no overhang of tool on*
Gridley Automatics

On all other Automatics there is an overhang of the tool. This overhang prevents the performance of accurate work, because the method of supporting tools doesn't permit as **heavy cuts or as coarse feeds.**

Besides being free from overhang, Gridley Automatics are free from many small parts which make others so complicated, and they handle a **wider range of work.**

You can change the tools on a "Gridley" as quickly as you can on a hand machine.

The idle movements are always at constant speed—much faster than others—which helps toward a faster production.

One man can operate from 3 to 6 machines at once, a nd can use tools tandem when rapid production is necessary, hence a saving of labor.

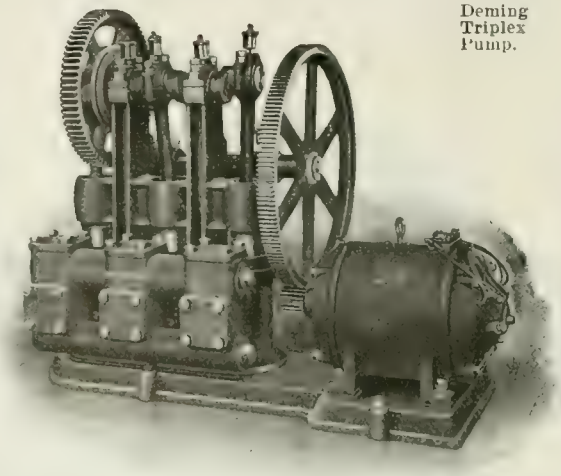
Let us put all the Gridley distinctive features before you—drop a line for catalog.

Windsor Machine Co., Windsor, Vt., U. S. A.

Canadian Office, 1501 Royal Bank Building, Toronto
E. C. Roelofson, Manager.

Are You Making Shells?

Good pumping machinery is essential to the greatest output. We manufacture steam and power pumps for every kind of service.

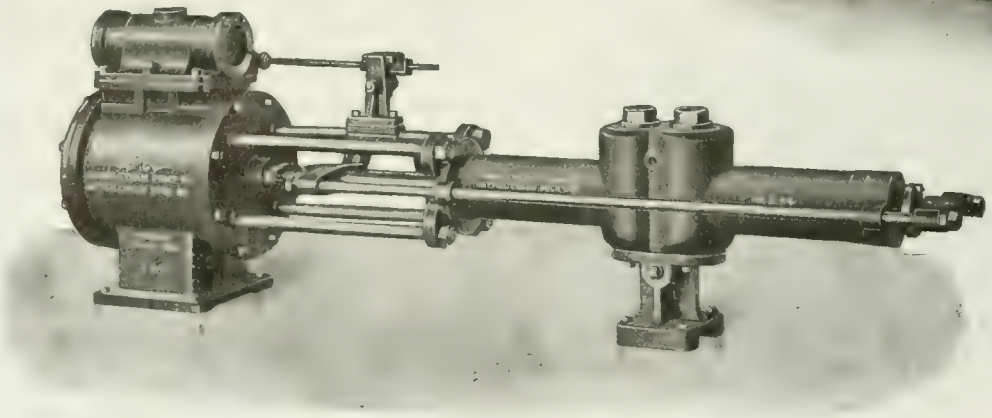


Deming Triplex Pump.

Darling Brothers Limited

Toronto MONTREAL Winnipeg

MADE IN CANADA



Burnham Hydraulic Pump

We are manufacturing special machines used in shell making.

TELL US WHAT YOU NEED.

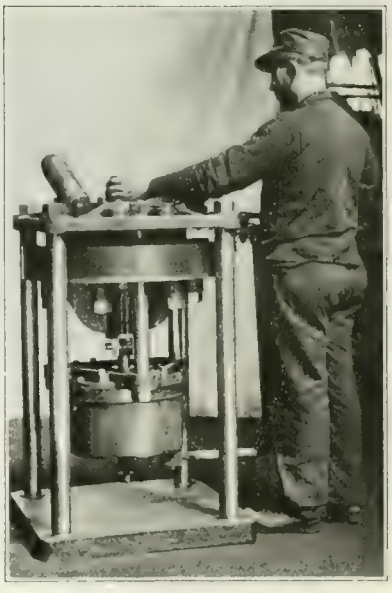
Shell Banding

The action of this pneumatically operated Banding Press is such that the dies strike a sharp blow and exert a heavy pressure, firmly forcing the band into the shell groove.

It is all ready to connect to your shop line. Production is only limited to your operator's ability to handle the shells. One operator and helper could easily produce three to four shells per minute.

The capacity of the machine is up to 5½" shells.

For full details and price write



THE MOTCH & MERRYWEATHER MACHINERY CO.

CLEVELAND

DETROIT CINCINNATI PITTSBURGH

In our Cleveland warehouse we have some 500 second-hand machines of all kinds, ready for immediate delivery.

The advertiser would like to know where you saw his advertisement—tell him.

Riveting Explosive Shells

IN TEN SECONDS

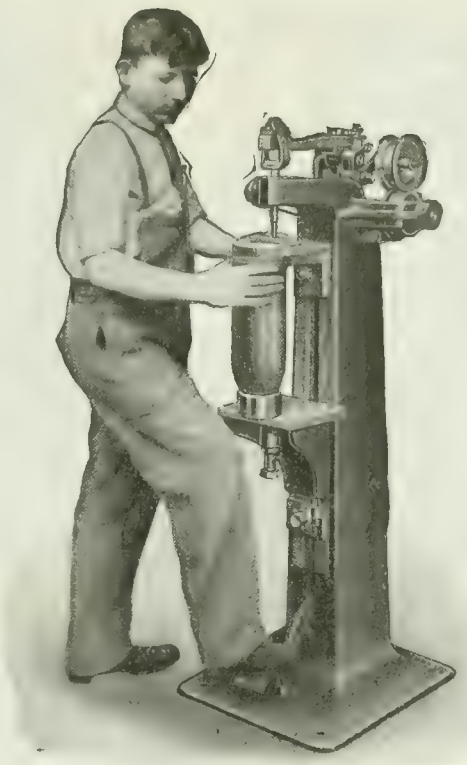


Illustration shows operator riveting the base of an explosive projectile.

This is a part of shell manufacturing which is absolutely necessary in order to prevent the gas from the explosive charge behind the shell from reaching the explosive contents of the shell itself. Neglect of this would probably cause the shell to explode in the gun and probably kill the gun crew.

After the shell is in position the machine is started and the shell is rotated one complete revolution by hand and, with the machine striking about 2,000 blows per minute, the plug can be riveted perfectly tight into the base in about ten seconds.

Change of fixture enables machine to be adapted for 4.5″, 18 pounds, or shells even larger than 4.5″.

FURTHER PARTICULARS ON REQUEST.

The Grant Mfg. & Machine Company

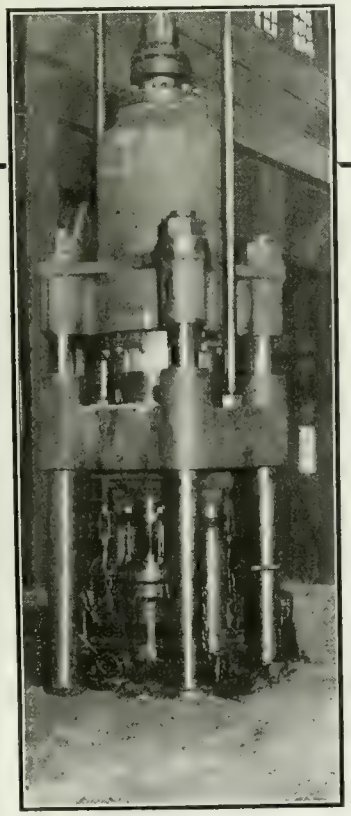
Bridgeport, Conn., U.S.A.

E. S. Station

Hydraulic Presses

for

Shell Manufacturing



PIERCING PRESS

We are making

HYDRAULIC PRESSES

for Piercing and Drawing

Shells and Projectiles

and are in a position to give

Prompt Delivery

The William Cramp & Sons Ship and Engine Building Company

PHILADELPHIA, PA.

ACME

Cutting Lubricant used on Shrapnel Shells

Keeps the tools clean and cool and increases production.

"Acme" is a free, unsaponified, animal oil lubricant, which will not separate in solution, gum machines or rust the work.

"Acme" will not clog pipes or stick to the finished work as oil does. Has a clean, wholesome smell.

Leading manufacturers use it on shell work in preference to oil; costs less, increases production.

Use it on your Gear Hobbers, Milling Machines, Turret Lathes and Automatics.

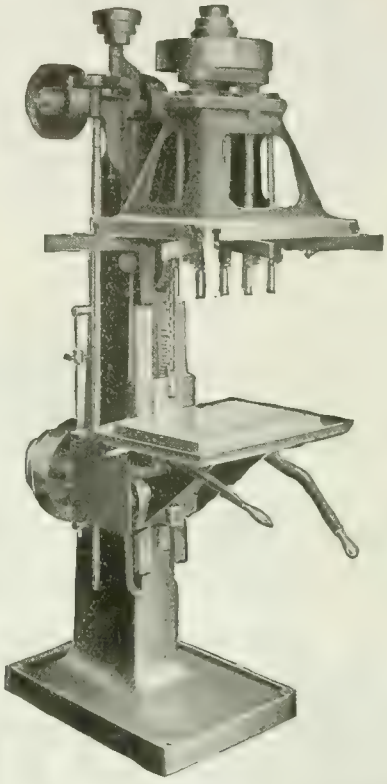
We solicit your trial order and will ship on thirty days' approval, subject to practical test.

Cataract Refining Co., Limited

TORONTO, ONTARIO

TRADE FOX MARK

Multiple Spindle Drills



No. 0 DRILL—8 Drills 1-2 inch Diam. Power Feed

$250.00 to $450.00

ACCORDING TO EQUIPMENT

Look your drilling work straight in the face and you cannot ignore the saving which a "Fox" Multiple will effect.

We drill 2, 3, 4 or more holes in the same time you now consume in drilling 1 hole. Figure the saving for yourself!

SEND FOR FULL DETAILS

FOX

MACHINE COMP'Y

649 Front Avenue, N. W.

GRAND RAPIDS, MICHIGAN, U. S. A.

TO THE USER OF WRENCHES

Users of Wrenches, both Pipe and Monkey Wrenches, will find economy in buying the Trimo makes. A new standard of quality has been set by Trimont Mfg. Company, the makers of these improved wrenches.

Be sure to ask for the Trimo Wrenches, both Pipe and Monkey, which are all-steel goods. They are equipped with Nut Guards that prevent the accidental turning of the adjusting nut in close quarters, and with Steel Frames, in the principal sizes that will not break.

These new Trimos are worth more to the user because of these improvements. Ask for the genuine and take no other. Don't let unfair dealers pass out the imitation on you. The name Trimo is on every Trimo tool.

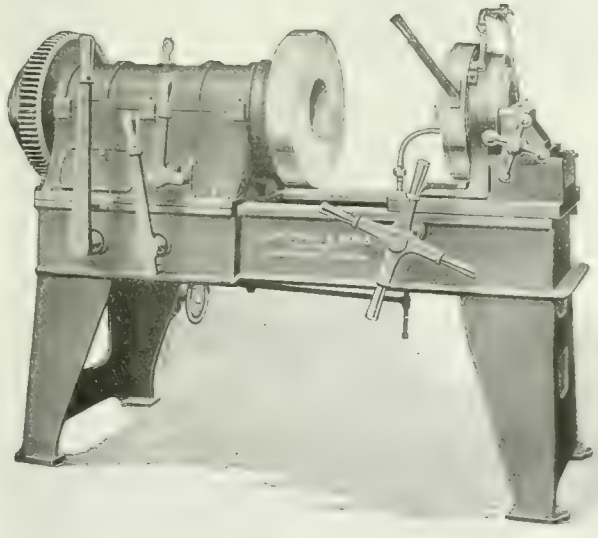
Very truly yours,

TRIMONT MFG. COMPANY,

Roxbury, Mass.

(MADE IN CANADA)

THE HALL NO. 6 PIPE MACHINE



When you buy Hall Machinery you keep Canadians employed. We are a Canadian firm, employing none but Canadian labor. Our guarantees are not at "Long Distance." We are at your door.

Our Machinery is the best that mechanical ability can produce and does not cost as much as imported machinery.

Write us for catalog and prices on pipe-threading lathes, any capacity, from 1/8 to 18-in., also single and double head rapid nipple machines. No delays, delivery from stock.

JOHN H. HALL & SONS, LIMITED
BRANTFORD, CANADA

Starrett Calipers

Variety of Styles

Practically every job of the machinist requires calipers of some kind for laying out or measuring the work. The Starrett line of calipers includes a number of styles and sizes to suit the general needs of machinists as well as special styles for particular operations. The line includes toolmakers' spring calipers, Fay and Yankee calipers, firm joint calipers, lock joint transfer calipers, Hermaphrodite calipers, etc.

Toolmakers' Calipers

For the use of toolmakers and machinists who work on delicate operations requiring sensitive measurements, we make a line of light round leg toolmakers' calipers of great stiffness and strength which are perfect for delicate work. Sizes and prices as follows: (includes both inside and outside styles) 2″—$1.00, 3″—$1.25, 4″—$1.50, 5″—$1.50, and 6″—$1.75.

Send for Free Catalog

Our free catalog No. 203, sent free on request, gives styles and prices of 2100 styles and sizes of fine tools and hack saws. Send for it.

The L. S. Starrett Co., Athol, Mass.

World's Greatest Toolmakers

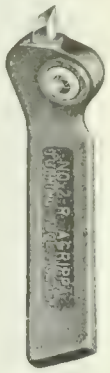
New York London Chicago 42-456

Starrett Tools

The Standard Instruments of Precision

Hex Head Cam

Headless Cam



PROGRESSIVE Superintendents know the tremendous economy of tool holder use, but many of them preferred to forego the economy and escape the annoyance of set screw troubles and breakage delays.

We were gratified recently at receiving an order for a full line of

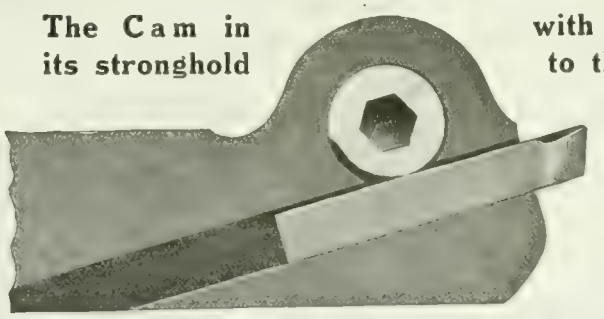
Williams' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

for Turning, Planing, Boring, Threading, Knurling, Cutting-off and Side Work from such a Superintendent and questioned him upon his change of heart.

He confessed

The Cam in its stronghold



with its back to the wall

had penetrated his blindfold, convincing him that cam fastenings are more serviceable than any other fastenings ever used in tool holders, because they can be made to grip tighter (the greater the pressure the tighter the lock) and because they cannot strip, upset, or "lose their heads." Hence long life to

Williams' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

J. H. WILLIAMS & COMPANY

43 Richards St. **Brooklyn, N.Y.**

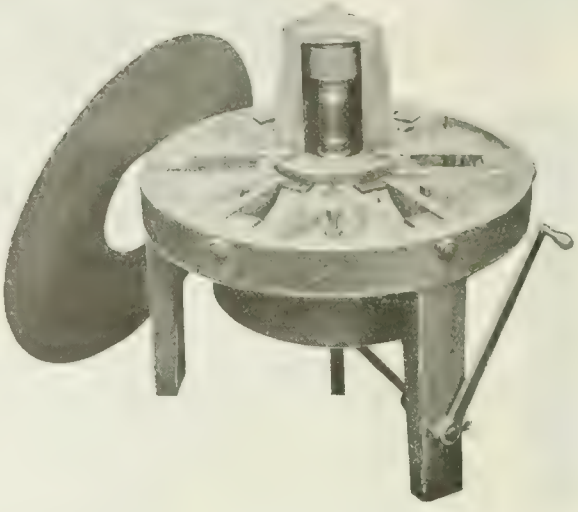
Western Office and Warehouse,
40 So. Clinton St., Chicago

Exhibitors at Panama-Pacific Exposition,
Block 18, Machinery Palace

YOUR CALL WILL PLEASE US

Write for new Catalogue—just out—showing a complete line of Drop-Forged Tools

Shell Painting, Nosing and Banding Machines



For nosing, pressing bands on shrapnel and high explosive shells; also painting shells.

SIMPLICITY: That is the beauty of these machines; they are so simple that a **woman or even a child can control them.** This is an important feature in reducing operating expenses.

Banding Press is sold without nosing attachment if desired.

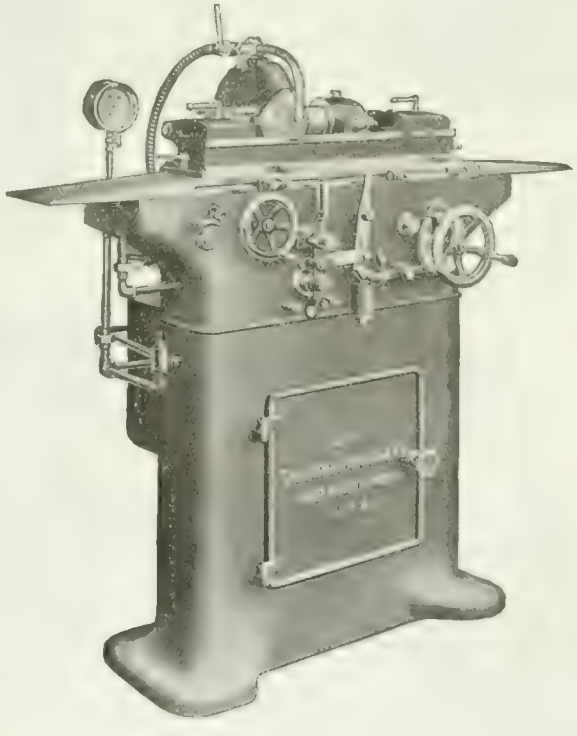
Painting Machine is operated with an ordinary air drill, and, if desired, a heating coil under table, enclosed in a sheet steel shell, can be supplied, as shown in cut.

Canadian Locomotive Company, Limited, Kingston, Ont.

SALES HANDLED EXCLUSIVELY BY

The John Bertram & Sons Company, Limited, Dundas, Ontario, our agents for these machines

ECONOMICAL PRODUCTION



That's what you will get with a

Greenfield

This machine fills a real need in Canadian manufacturing. It will produce at low cost a lot of small work which manufacturers have been obliged to grind on their big machines at a great disadvantage.

With its low price it is at the disposal of such manufacturers as have not felt able to make the investment necessary for large and expensive machines.

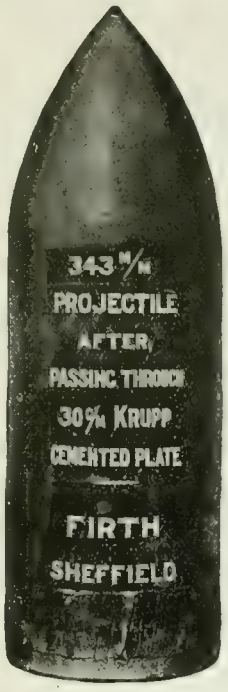
This grinder swings 5 inches and takes 13½ between centers. It is a particularly high producer on work 2 inches and under in diameter, although we have obtained some fine records on work as large as 3½ inch.

We solicit correspondence from manufacturers with grinding in this class.

Greenfield Machine Company

Greenfield, Mass., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



Weight 1400 lbs.

Established 1840

Firth's "SPEEDICUT" High-Speed Steel

FOR LATHE, PLANER AND BORING TOOLS, ETC.

THE IDEAL STEEL FOR MACHINING

SHELLS

Being one of the largest manufacturers of **Armour-Piercing** and **High Explosive Projectiles** we possess unusual facilities for testing the cutting capabilities of High-Speed Steel, and our improved **SPEEDICUT** has been elaborated after many years of scientific research to meet the demand for a steel of the highest efficiency.

It is sold in **Annealed** Bars and Discs.

High-Grade Tool Steel for Every Purpose.
The Largest Stock in Canada.

Thos. Firth & Sons, Limited

Norfolk Works and Tinsley Works
SHEFFIELD, ENGLAND

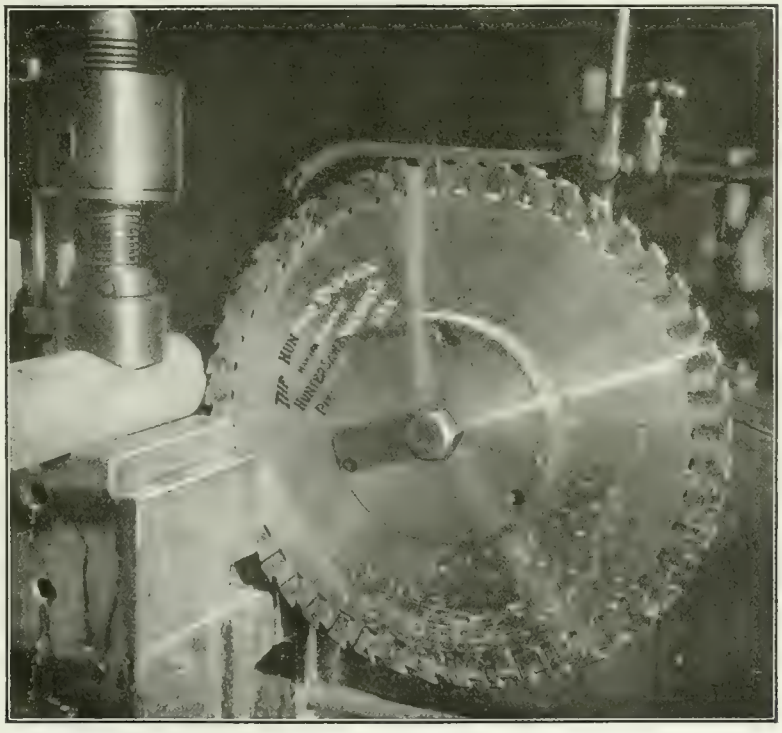
Works also at Riga, Russia; McKeesport, Pa., and Washington, D.C.

13½ inches Dia.

Canadian Warehouses 507 St. Paul Street, MONTREAL; 79 Adelaide St. W., TORONTO

J. A. SHERWOOD,
Canadian Manager

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

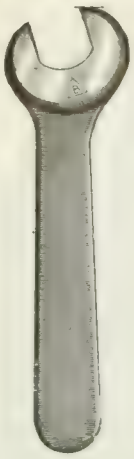
The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably—on shrapnel or any other stock.

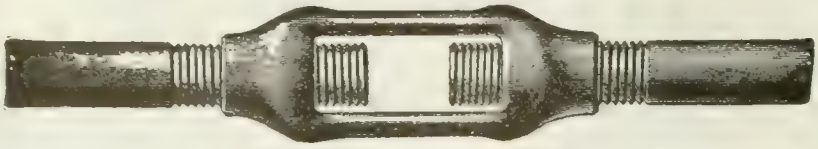
Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Plyers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.



B
TRADE MARK

All Kinds Of Special Drop Forgings

Send Models or Blue Prints for Estimates

WRITE FOR CATALOG

Canadian Billings & Spencer, Limited, Welland, Ontario

B. AND C. ADJUSTABLE "S" NUT WRENCH

—operates with ease in the corners where a monkey wrench is useless

ALWAYS UNDER YOUR THUMB. The operating nut being of sufficient diameter, the wrench is easily adjusted by the thumb of the hand that holds it.

All the parts are strong and durable. The operating nut is steel, and the sliding jaw a steel drop forging. All parts are carefully tempered and hardened.

TRADE B&C MARK

It's the standard among wrenches of this style, and a tool you'll find invaluable to your kit.

Drop a line for complete catalog on wrenches.

BEMIS & CALL HARDWARE & TOOL COMPANY, Springfield, Mass.

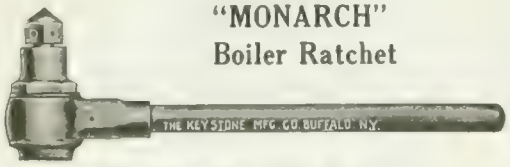
"Keystone Quality"

Means Maximum Tool Service

"KEYSTONE" 200-M Combination Ratchet

4 complete Ratchets in one. All parts interchangeable.

"MONARCH" Boiler Ratchet

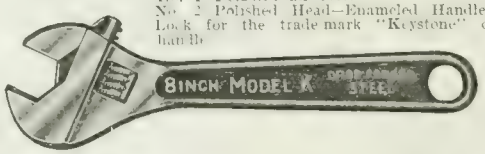


For Square Shank Drills Only.
STRONGEST RATCHET MADE.
Fully guaranteed.

KEYSTONE "Model K" Wrench

Made in two finishes
All drop-forged steel.

No. 1—Polished all over.
No. 2 Polished Head—Enameled Handle.
Look for the trade mark "Keystone" on the handle



The Original "WESTCOTT" Adjustable "S" Wrench

HANDLE MALLEABLE IRON, JAW FORGED STEEL.
The "Westcott" Wrench is acknowledged to be the most convenient and useful wrench for general use, and can be used in many places inaccessible to the Monkey Wrench. These wrenches are made of best class material, are strong and durable. The genuine "Westcott" Wrenches have the trade mark "Westcott" on the handle.

KEYSTONE TOOLS

ARE THE KIND THAT MAKE YOUR MONEY GO FARTHER AND ASSURE YOU THE UTMOST IN UTILITY AND CONVENIENCE.

Write for catalog.

Practically every reliable wholesale house sells them. We'll be glad to refer you to your nearest dealer.

The Keystone Mfg. Co., Buffalo, N.Y.

SPRINGS, WIRE & STEEL
THE WALLACE BARNES CO. ESTABL. SINCE 1857
BARNES-MADE PRODUCTS
1857
BRISTOL CONN. U.S.A.
SCREW MACHINE PRODUCTS

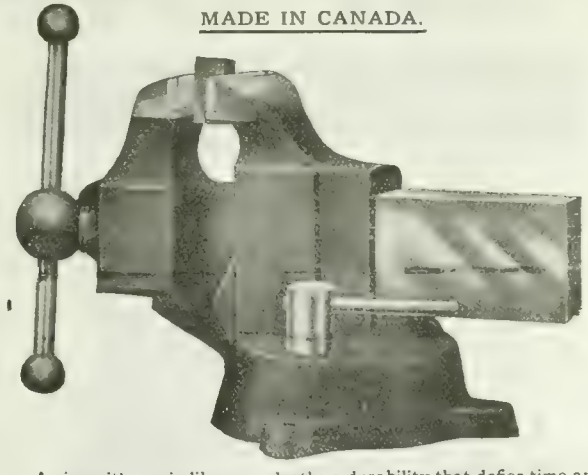
SPECIAL SPRINGS
AND
Screw Machine Products
MADE ON CONTRACT

to the most exacting specifications, and deliveries made as desired.

Ask for Booklet 6-T.

Established 1857.
THE WALLACE BARNES COMPANY
218 SOUTH STREET, BRISTOL, CONN., U.S.A.
Manfrs of "Barnes-made" Products
Springs Screw Machine Products Cold Rolled Steel and Wire

The YOST
Solid Jaw and Swivel Bottom Machinist's Vise
MADE IN CANADA.



A vise with a grip like grim death; a durability that defies time and the hardest usage.
A vise that will give you a lifetime of perfect service and satis.action. The metal in a Yost Vise is of faultless quality, perfectly distributed and the workmanship is

Incomparably Good

The National catalog would certainly interest you. Write us, asking for a copy.

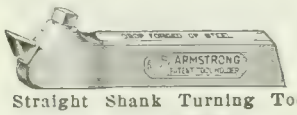
National Machinery & Supply Co., Ltd.
HAMILTON - - ONTARIO

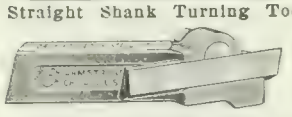
This Guarantee Goes With Every Vise: We fully guarantee all of our Vises to be satisfactory in every particular and will promptly replace, without cost, any parts broken or badly worn when such failures are due to faulty material or construction.

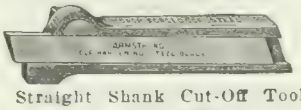
YOU WANT TOOL HOLDERS THAT HAVE MADE GOOD
ARMSTRONG TOOLS

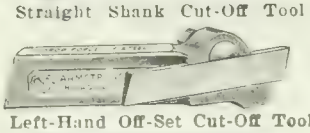
Made good from the start and have kept pace with modern improvements in Machine Tools and tool steel—enlarged head, heat treated shank, heavier screw, bigger cutter, all making for increased production.

You can't afford to shut your eyes to a proposition which so directly affects your


Straight Shank Turning Tool


Left-Hand Off-Set Side Tool


Straight Shank Cut-Off Tool

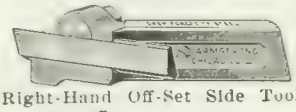

Left-Hand Off-Set Cut-Off Tool

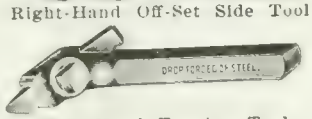
Planer and Shaper Tool

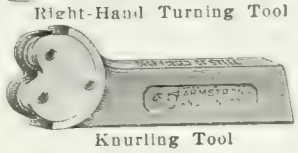
Boring Tool

Right-Hand Off-Set Cut-Off Tool

Threading Tool


Right-Hand Off-Set Side Tool


Right-Hand Turning Tool


Knurling Tool

PROFIT and LOSS on LATHE and PLANER TOOLS

TOOL HOLDER PROFIT

No Forging.
Mighty Little Tool Steel.
Minimum of Grinding.
Machines All Running.
Men All Working.

FORGED TOOL LOSS

Blacksmiths' Time, etc.
Large Stock of "Dead" Tools, Steel, etc.
Men Waiting at Forge or Tool Room.
Machines Standing Idle.
Wasted Time and Material Grinding Tools.

THE ARMSTRONG SYSTEM

recognizes the **Human Factor**, cuts out **Red Tape** and increases efficiency of Men and Material.

More than 100 shapes and sizes for performing every operation on lathe, planer, shaper and slotter.

THE LATEST ARMSTRONG CATALOG

is a complete exposition of the whole Armstrong System. We want the man interested in keeping down production costs to have a copy mailed free for the asking.

Our complete line is on exhibition in Block 41, Palace of Machinery, Panama-Pacific Exposition, San Francisco.

Armstrong Bros. Tool Co.
"The Tool Holder People"
306 N. Francisco Ave., CHICAGO, U.S.A.

Headless Screws

ALL KINDS
FOR
SHRAPNEL SHELLS
AND FUSES

sometimes called "Grub Screws," are a part of Shell manufacturing.

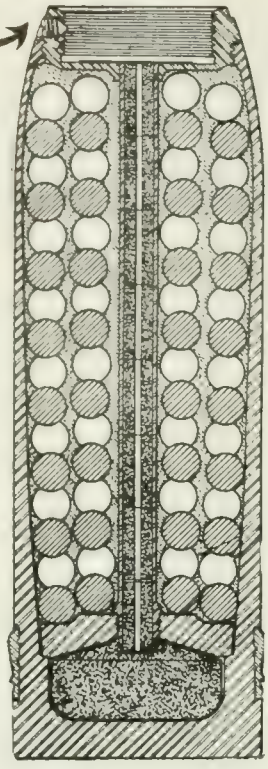
Small in the unit—3-16 in. diameter and ¼ in. long—yet when you consider the multitude used, the aggregate business is very large.

These Headless Screws are used for both

Shrapnel and Lyddite

Shells, sizes to suit require ments.

We have screws for other uses—Let us acquaint you with our product.



BLAKE & JOHNSON CO.
WATERBURY, CONN.

Steel for Shells!

PROMPT SHIPMENT

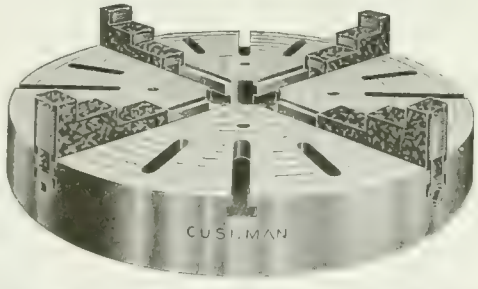
Billets and rounds of suitable physical and chemical specification for forging and turning into shrapnel cases and lyddite shells of any size.

LACKAWANNA STEEL COMPANY

Standard structural shapes,
Standard heavy and light rails,
Sheared and universal mill plates,
Sheet bars, and Lackawanna
Sheet Steel Piling.

General Sales Offices: LACKAWANNA, ERIE CO., N.Y.
Canadian Correspondents:
H. A. DRURY & CO., LTD., 309 Craig St. W., MONTREAL

Cushman Chucks



When you buy a "Cushman" Chuck you are absolutely sure of getting one having strength, accuracy and durability. Being specialists in these goods we are able to furnish Chucks of quality at a very moderate price.

Our line of styles and sizes is very complete—

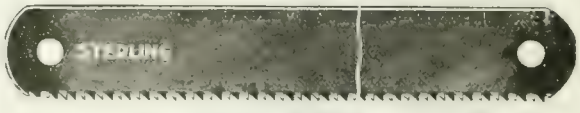
Lathe Chucks, Drill Chucks, Centering Chucks, Portable Face Plate Jaws

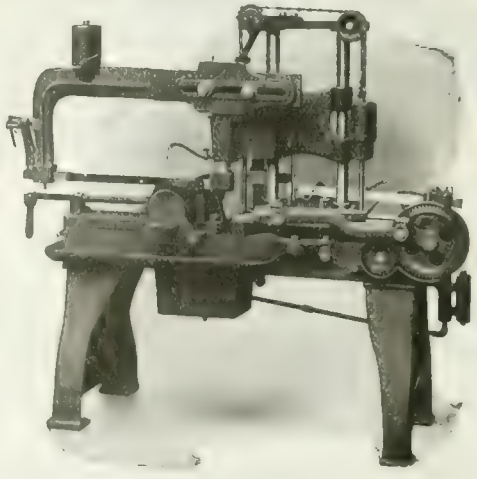
Our regular chucks are known as the heavy pattern, but we now have a new line called "Blue Line" Chucks, made entirely of steel.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

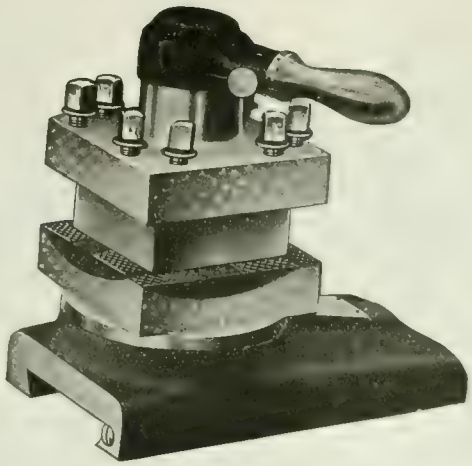
"STERLING" HACK SAWS





MANUFACTURED BY
DIAMOND SAW & STAMPING WORKS
BUFFALO, N.Y., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.



Particularly Adapted to the Manufacture of Shrapnel

Your Lathe Needs A NEW TOOL POST. One of the Modern Multiple Type.

You can no longer afford to use the old style single tool holder.

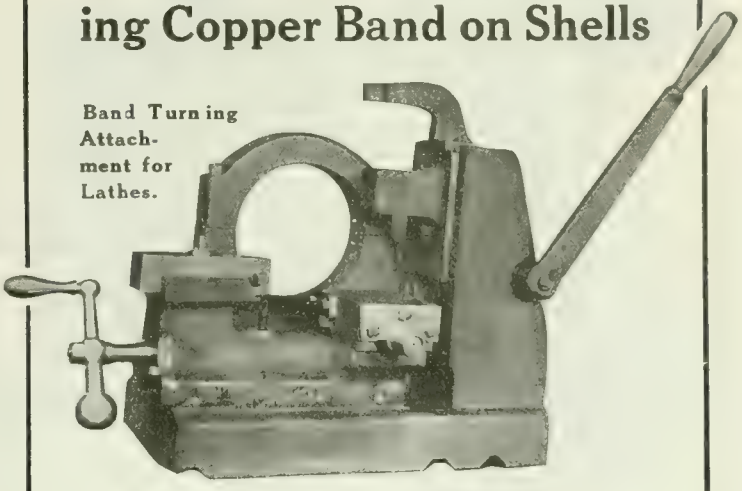
Give us the size of the dovetail on your lathe carriage and height to lathe center; we will quote you price on a Modern Tool Holder that we guarantee will increase your production, and give you some interesting facts about Lathe Turrets.

No matter what make or size of lathe—we can fit it.

Fay & Scott, Dexter, Me.

A Time-Saver for Turning Copper Band on Shells

Band Turning Attachment for Lathes.



This attachment will fit any engine lathe, and with its use you can turn the copper band on Shrapnel Shells down to size required and burnish them *all in one operation.*

With this device we will guarantee an output of

50 Turned Copper Bands per Hour

Used with a specially constructed steel chuck, casting of which can be finished on the lathe on which the attachment will be used.

Castings are supplied by us.

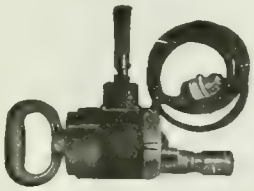
WRITE FOR PARTICULARS.

LYMBURNER LIMITED

5-15 Commissioners St. Montreal, P. Que.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



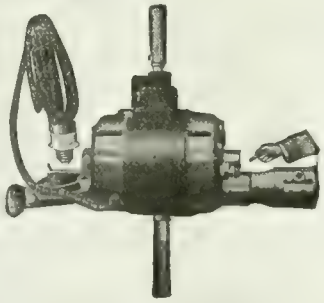
They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

2 SIZES.

3-16 inch,	W.G.T.	6 lbs.
¼ inch,	W.G.T.	9 lbs.
⅜ inch,	W.G.T.	12 lbs.

All motors wound for 110 or 220 volts.
Direct or alternating current.
Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



½ inch—2 SPEED.
Speed, 400-750 R.P.M.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

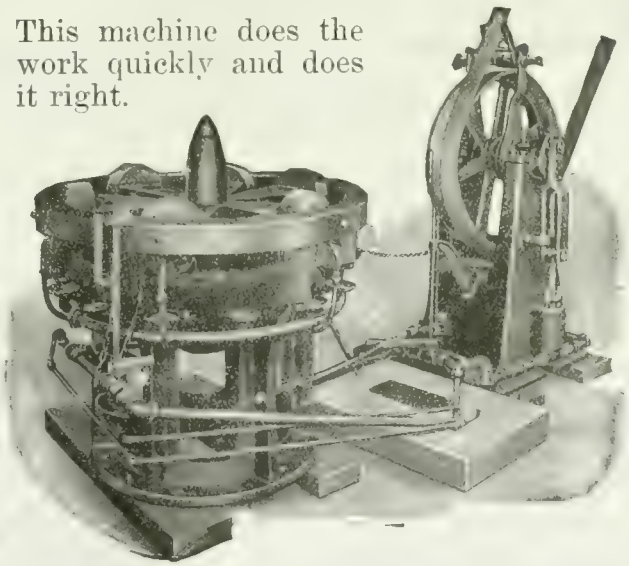
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver.

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

Hydraulic Banding Machine

For compressing bands on shrapnel shells and other projectiles

This machine does the work quickly and does it right.



In writing for information or quotation please advise width and thickness of bands and diameter of shells to be handled.

Machines for our Canadian Customers are built in Hamilton, Ont.

We also manufacture machines for setting wagon and carriage tires, cold.

Please address all communications to our Rochester Office.

THE WEST TIRE SETTER COMPANY
ROCHESTER, NEW YORK

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Motor Driven Speed Lathe

This style of motor drive employs a constant speed motor mounted on a plate having an extension arm to support a bearing for the outer end of the motor shaft. The motor plate is fitted to a slide on a shelf which is securely fastened to the back of the lathe bed. The motor plate is moved by means of a screw which tightens or loosens the belt. A four-step cone pulley on the motor shaft is belted to a four-step cone pulley on the spindle. This gives the same speed variations as when a countershaft is used, and by means of various size cones on the motor a wide range of speeds are obtainable.

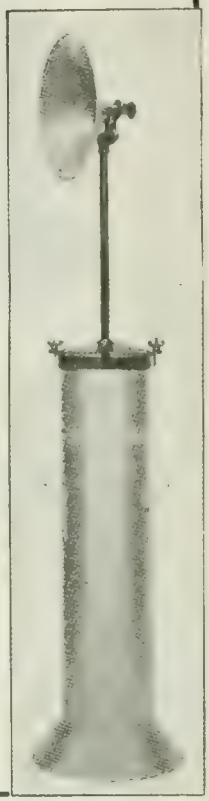
The lathe spindle is made from high carbon steel, ground to size, and running in self-oiling bronze bearings. The tailstock has screw and lever feed. The bed is crossed braced and all clamping levers are above the ways.

J. G. BLOUNT CO. - Everett, Mass., U.S.A.

THE Carbic Régd LIGHT

WAKEFIELD'S PATENTS

THE CARBIC FLARE LIGHT
2,000 C.P.



BRIGHT AS SUNLIGHT

TURNS NIGHT INTO DAY

Indispensable for Construction Work, Railroad Auxiliaries, Foundries, Mines, etc.

Absolutely Non-Explosive. Easy to Operate. Nothing to Get Out of Order. Can be Re-charged in a Minute.

Made in two sizes:

No. 1, Burns 6 hours.
No. 2, Burns 12 hours.
Takes No. 20 Carbic Cake.

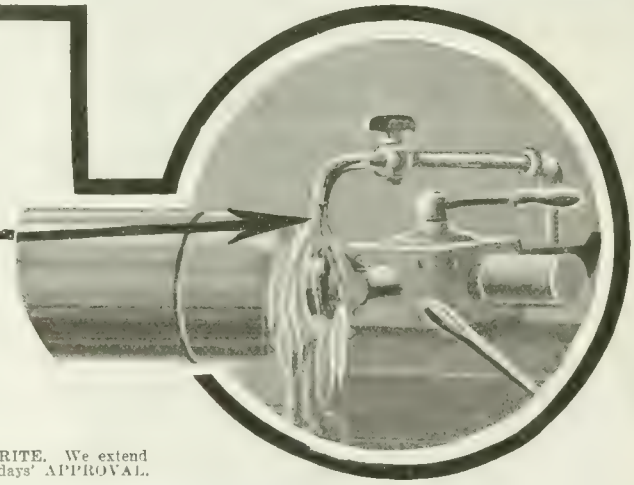
Absolutely the most economical lamp on the market to-day.

W. L. FOSTER

8 LOMBARD ST., TORONTO, CAN.

JUSTRITE

CUTTING LUBRICANT



A Manufacturer Producing 3000 Shrapnel per Day Uses JUSTRITE Because

(a) He gets a higher speed in turning operations.
(b) Gives finer finish.
(c) Lasts. Grindings of cutting tools a saving of time and cutting tools.
(d) A clean, bright thread, ragged edges unknown.
(e) Swarf is left clean and polished.
(f) No smoke or obnoxious odors about the shop.
(g) [illegible] Write us immediately to make immediate shipment.
(h) [illegible]

A number of the largest Shell Manufacturers in Canada have placed orders for JUSTRITE. We extend the invitation to EVERY Shell Manufacturer in the Dominion to order a barrel on 30 days' APPROVAL. Write for yours now.

Crescent Oil Company, 30 Church St., N.Y. City.

Canadian Representatives: Rudel-Belnap Machinery Co., Limited, Montreal, Toronto

Also Mfrs. of "Aqualine" Scientific Cutting Lubricants, and "Duocene" Semi-Soluble Oil.

Electric Travelling Cranes

(Direct or Alternating Current)

Steam and Electric Derricks

(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.

ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited

MONTREAL

16 in. Lever
POST DRILL

A Giant Little Machine For Light Drilling.

Will drill up to 7/8 inch.

The Feed Lever Socket is adjustable on the feed shaft, to provide for setting the lever in the most convenient position for the operator.

An adjustable friction is provided for the feed shaft, which acts as a balance to the weight of the spindle

Bevel Gears, Feed Pinion and Rack are all machine cut, working smoothly and without noise.

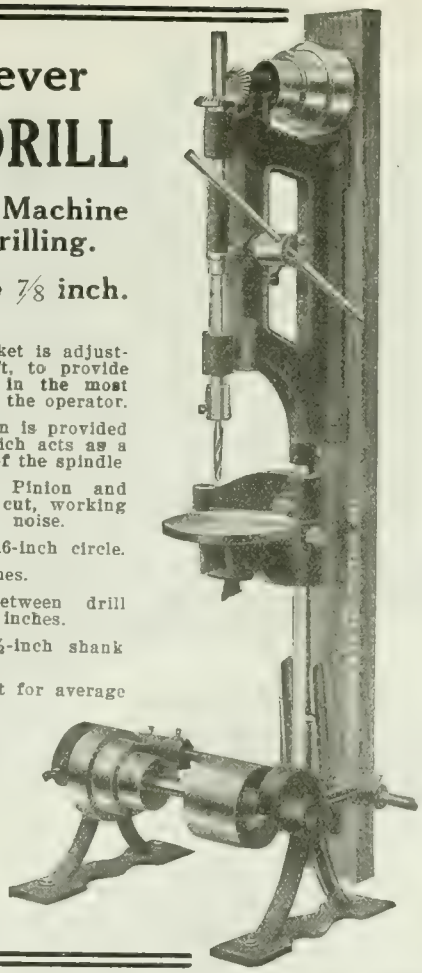
Drills to centre of 16-inch circle.

Run of feed 5¼ inches.

Greatest distance between drill spindle and table, 23 inches.

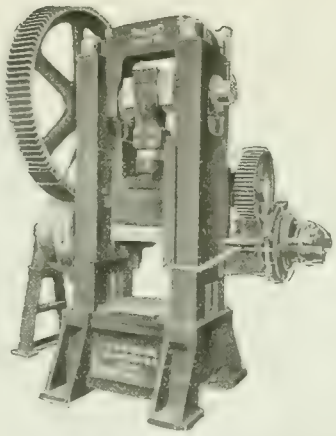
Spindle bored for ½-inch shank twist drills.

Speed of countershaft for average work, 300 per minute.



A. B. Jardine & Co.

Hespeler, Ontario



BLISS

Presses Reduce Your Up-Keep Costs

Bliss Straight-Side Presses

embody a strength and rigidity that minimize maintenance cost of both machine and tools.

They are adapted for heavy punching, piercing, shaping, drawing and stamping. Built in ten standard sizes, there is a particular size to meet your needs. Write to-day for descriptive matter stating requirements.

VISIT OUR EXHIBIT AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION, MACHINERY PALACE, BLOCK 16.

E. W. Bliss Co., 20 Adams Street, Brooklyn, N.Y., U.S.A.

CHICAGO OFFICE: 622 West Washington Boulevard.
DETROIT OFFICE: Dime Bank Building.

ELMES HYDRAULIC PRESSES

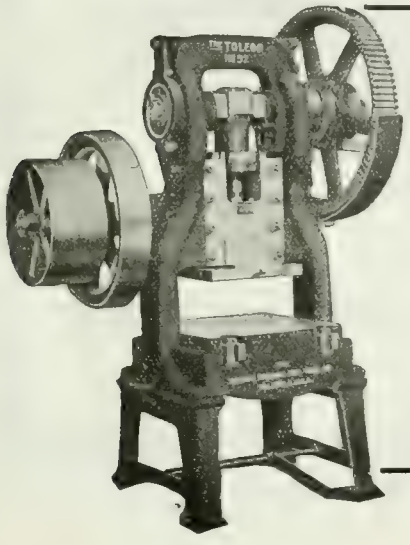
Rapid-acting hydraulic drawing presses, piercing presses, pumps, and accumulators for making Shells, etc. High pressure fittings and valves, quick shipment.

Send for our illustrated catalog to day.

Charles F. Elmes Engineering Works

217 N. Morgan Street, Chicago, U.S.A.

Over 50 years' experience building hydraulic machinery.



There is no true substitute for the Service a "Toledo" Arch Press will give

Rigid construction, increased weights, superior form of connection, protection of gears and exposed parts, and the whole design make these the logical and practical presses for shops where special presses cannot be advantageously installed. No. 52 for large piercing, blanking and forming dies on heavy stock; for cutting blanks and for forming, finishing and wiring drip pans, electric heaters, etc. Geared or plain—with or without removable front.

THE TOLEDO MACHINE & TOOL CO.

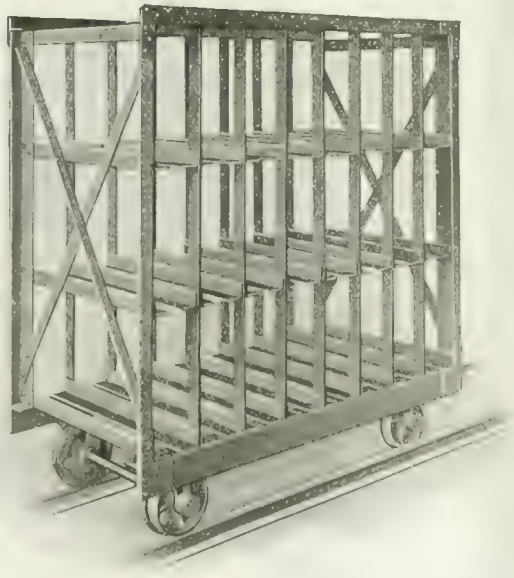
TOLEDO, OHIO

One of the types of Crawford Sectional Ovens used by Manufacturers for Baking the Varnish or Protection Finish on Shrapnel and High Explosive Shells.

These ovens are equipped with the only gas burner that gives a combined radiated heat and circulation of pre-heated air in the oven.

The gas and air are mixed and combustion in the large cylinder supported by air from a positive pressure blower which gives the highest efficiency and economy known for burning either city, natural, gasoline or producer gas, and there is no exposed flame in the oven.

The truck shown holds (120) twenty-eight-pound shells and is planned to stand the shells on end, resting on angles. Other designs have been built for shells ranging in weight from fifteen to eight hundred pounds, the last mentioned shell being forty-eight inches high by twelve inches in diameter.



The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

Canadian Representatives: THE A. R. WILLIAMS MACHINERY CO., LIMITED, TORONTO, CANADA

Summer Cooling

by the

"Sirocco" TRADE MARK

Fan System

Operatives to work at their highest point of efficiency **must be comfortable.**

The atmospheric condition of your plant plays a most important part in this connection. The "Sirocco" System will provide for a Cool, Comfortable atmosphere in Summer, and a warm, comfortable atmosphere in Winter, with Positive Ventilation in all seasons.

Let our Engineers tell you how "Sirocco" could be adapted to your plant. No cost for this service. Interesting literature on "Sirocco" will be sent at your request.

CANADIAN Sirocco COMPANY LIMITED

WINDSOR. ONTARIO.

Sales Engineers:

S. S. Clarke, 605 2nd St., Calgary.

A. M. Nichol, 301 McGill Bldg., Montreal.

C. T. Morse, 83 Wilson Ave., Toronto.

H. V. Heard, 604 Credit Foncier Bldg., Vancouver.

W. P. Eddy, 214 Donald St., Winnipeg.

Nova Scotia Steel and Coal Company, Ltd.

BEG TO ANNOUNCE

That their new Steam-hydraulic Forge Shop is now in operation, as also is their recently installed "Harmet" Fluid Compression Plant.

These improvements bring "Scotia's" Equipment abreast of the best foreign forges.

They are accordingly open to supply forgings of all shapes and sizes, made of Best Ordinary or Fluid Compressed Open-hearth Steel, and satisfying the most severe specifications.

For prices and particulars apply to

Western Sales Office, Room 14, Windsor Hotel, Montreal, Que., or Head Office, New Glasgow, Nova Scotia

MALLEABLE IRON

Trade Mark

Castings

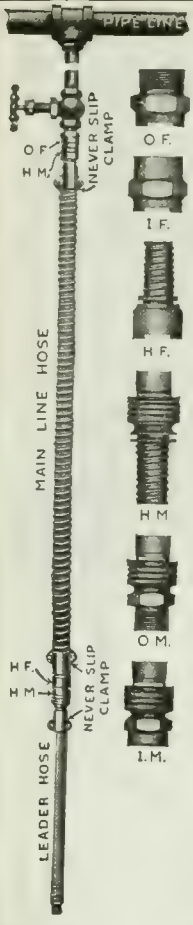
Any Size—From Ounces Up

Trade Mark

We make all kinds of Malleable Iron Castings, and all of the highest quality.

Our years of experience assure you the best service and castings that are satisfactory in every particular. WRITE us about your requirements.

International Malleable Iron Co., Ltd., Guelph, Ont.



CLEVELAND HOSE SPECIALTIES

Bowes Automatic Air Hose Couplings

Over 1,000,000 in general use

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-in. to 1½-in.

STYLE I.F. is an Inside Thread Female Pipe End. Made in sizes ¼-in. to 1½-in.

STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.

STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.

STYLE O.M. is an Outside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.

STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.

The Male and Female Ends of Bowes Couplings interchange in sizes, ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.

They are absolutely air-tight under all pressures.

They quickly pay for themselves by stopping costly leaks.

They interchange in sizes most commonly used.

They have no loose parts to be mislaid or lost.

They are made of brass and will not rust.

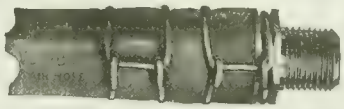
The U-shaped interchanges in couplings ¼-in. to ¾-in.

The Cleveland Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

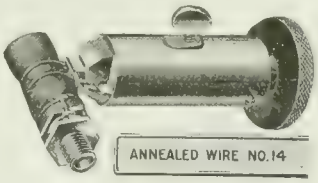
The adjoining cut of Never Slip Hose Clamp shows the "Flanges" which engages the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings to use and proper way to attach the clamps.

CLEVELAND GROOVED HOSE NIPPLE



Grooved Nipples when attached to hose with the wire clamp cannot "blow out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently. "Blow outs" are expensive, as one to five men are idle while new connection is being made; time wasted, ten to thirty minutes. Can you afford it?

WIRE CLAMP TOOL



To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, Etc.

WRITE FOR BULLETIN NO. 29.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Catalog No. 12, which illustrates our complete line of Air Tools

CLEVELAND PNEUMATIC TOOL CO. OF CANADA LTD., 80 Duchess St., TORONTO

A. R. WILLIAMS MACHINERY CO., TORONTO. WILLIAMS AND WILSON, MONTR

Defective Castings Made Perfect

Make-overs eliminated and many dollars saved

by the use of

SHELTON Metallic Filler

It completely obliterates blow holes, sand holes, etc. It becomes part of the casting itself, is durable, and can never be detected.

Shelton Metallic Filler not only prevents costly "make-overs," it enables you to ship every order on time. **No delays, no disappointed customers, no lost business.**

Don't let another casting go to the scrap-heap. Use Shelton Metallic Filler RIGHT NOW. **Its reliability has been proved by many years' successful service in America's leading manufacturing plants.**

Dictate your request for further particulars.

Shelton Metallic Filler Co.

DERBY, CONN.

50,000 AMERICAN STEEL SPLIT PULLEYS *In Stock!*

IT takes exceptional pulley sales service, besides exceptional pulley quality, to sell over 2¼ million of these steel pulleys to the biggest pulley buyers in the world. The great stocks of 50,000 AMERICAN PULLEYS in our warehouses in Philadelphia, New York, Boston, Chicago and Seattle, to say nothing of those carried by over 200 dealers throughout this country and Canada, are a part of this service. All styles and sizes from 3 to 72 inches are ready for almost instant shipment. We'll gladly send you catalog and price list without obligation.

THE AMERICAN PULLEY COMPANY

Philadelphia, New York, Chicago, Boston, Seattle.

ALL GOOD DEALERS

A HEART TO HEART TALK

TRADE MARK

MAGNOLIA ANTIFRICTION METAL

TRADE MARK

Simoon Sound, B.C.

Dear Sirs:

I live about 240 knots from the nearest machine shop and 30 knots from the nearest boat landing. I have a small, old style steeple engine in a boat doing work in log towing. As in most of those very old type of engines the crank brasses are very small, consequently it gave me a lot of trouble. I had trouble also with the thrust, which was simply a collar thrusting on the after journal. As to sending it to the shop, the expense was no object, but time was, so, as I had seen Magnolia Metal advertised, I got some from Fleck Brothers, Vancouver, and tried it on crank and poured a ring for the thrust. That was about ten months ago. I have not touched either one since, nor have they given me any trouble. As far as I have got it sized up you will not make much money out of me on Magnolia Metal, the way things look.

I want you to understand that I had real trouble before I used Magnolia Metal. My contract depended on my keeping going, and although my contract is out now, I am going yet. There have been times when that crank has been plunking in salt water for two or three hours at a time, and things would have been all off had it heated or gripped. There are other things that I have done with Magnolia Metal; for instance, I poured some rings in the piston of the feed pump 6 months ago. I have new rings now, but I won't put them in till the Magnolia Metal shows signs of giving out. If you wish to condense this letter so that it will read good, I shall be glad of it, because Magnolia Metal deserves more praise than I have yet seen in print.

Yours truly,

Feb 25th, 1915 CHAS. REYNOLDS.

PRACTICAL ENGINEER POCKET BOOK:

1915 Edition—Over 600 pages. A valuable reference work. Imported from England and sold as an advertising medium at the very low price of 40c post paid.

Address Montreal Office

SOLD BY LEADING DEALERS EVERYWHERE OR BY

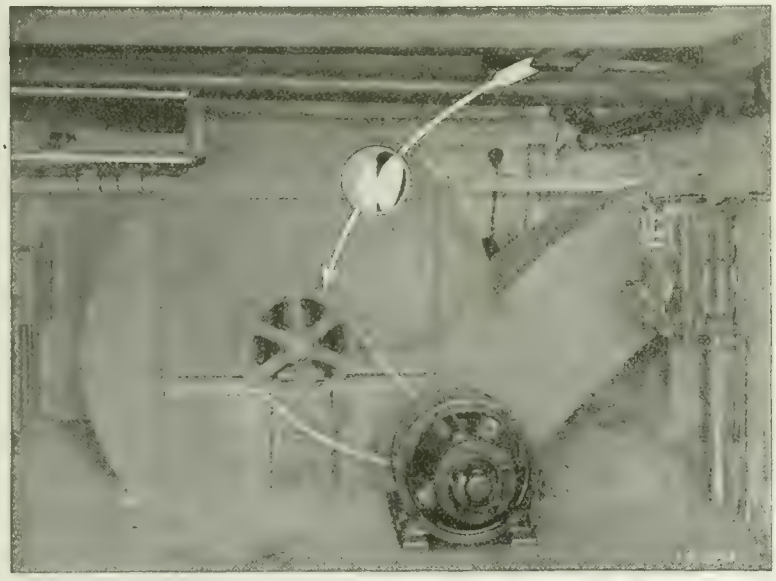
MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambroise St. MONTREAL

The advertiser would like to know where you saw his advertisement—tell him.

MORSE Silent Chains



For Ventilating Fans, Blowers, Etc.

MORSE Silent Chain Drive to such apparatus assures the maximum volume of air day in and day out for months and years with practically no attention and minimum up-keep cost.

They are reliable to the point where they can be left alone for days, even weeks, at a time without fear of interrupted operation, and durable to the point where it doesn't pay to use any other form of drive.

The illustration shows a 10 H.P. Morse Silent Chain Drive to a Ventilating Fan.

Adaptability

The well-known advantages of silent chain drives over gearing, belting and ropes are common to practically every industry. They may vary slightly in degree of importance, but not in fact. The driving of a machine or a shaft is simply a question of transmitting power to it no matter where it is used nor for what purpose. That MORSE Silent Chains do meet all requirements for the transmission of power is shown by the following partial list of industries in which they are largely used:

Agriculture	Ice and Refrigeration	Paint
Asphalt	Iron and Steel	Paper
Automobile	Irrigation	Pottery and Glass
Baking and Confectionery	Laundry	Printing and Publishing
Brick and Tile	Lumber	Railroad
Brewing and Bottling	Marble and Granite	Rubber
Canning	Marine	Shoe and Leather
Cement and Concrete	Military and Naval	Sugar and Beet Sugar
Cereal Manufacture	Milling and Grain	Textile
Coal and Coke	Mining	Woodworking, etc., etc., etc.
Electrical	Packing	

Morse Chain Company, Ithaca, N.Y.

SALES OFFICES AND REPRESENTATIVES:

Licensees for Europe: The Westinghouse Brake Co., Ltd., 32 York Road, King's Cross, London, N.

NEW YORK, 30 Church St. BOSTON, 141 Milk St. CHICAGO, Merchants L. & T. Building. PITTSBURGH, Westinghouse Building. CLEVELAND, 421 Engineers' Building. DETROIT, 735 Dime Bank Building. SAN FRANCISCO, Monadnock Building. ST. LOUIS, Morse Engineering Co., Chemical Building. MINNEAPOLIS, Strong-Scott Mfg. Co., 413 Third Street, S. ATLANTA, Earl F. Scott, M.E., 702 Candler Building.

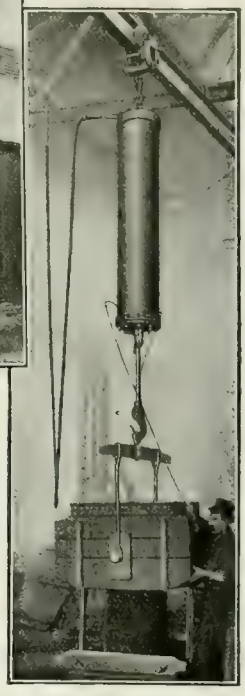
"MORSE" A CHAIN OF EVIDENCE

S99

IDEAL FOR CRANE ELEVATOR OR OVERHEAD SYSTEM

CURTIS POWER JIB CRANES

WRITE FOR CATALOG A-1



CURTIS AIR HOISTS

OR REGULATABLE AIR CYLINDERS

are virtually straight line motors, capable of the widest application to shop and industrial requirements.

FOR GENERAL HOISTING, they are superior to electric motors, are cheaper, more reliable, simpler, and have lower maintenance cost.
FOR DELICATE HOISTING, as for instance,

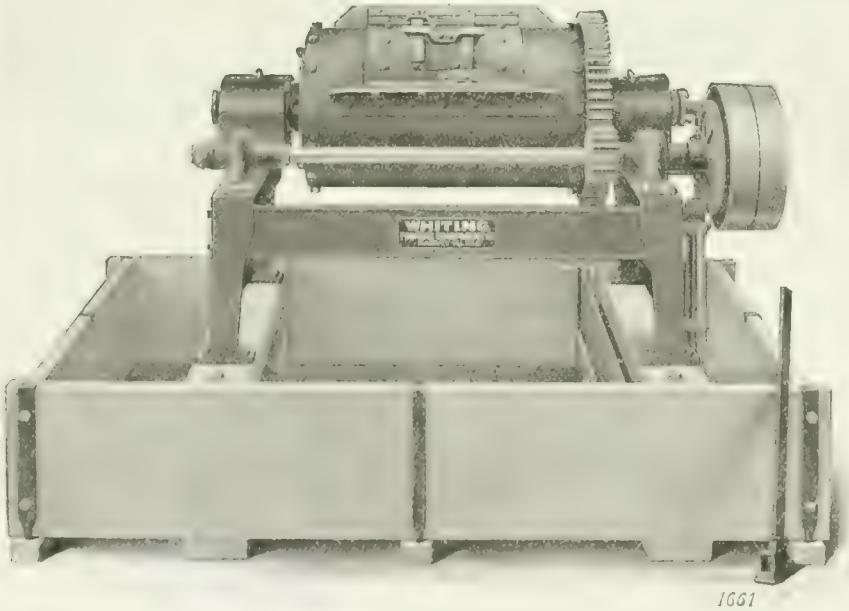
DRAWING PATTERNS—SETTING CORES—POURING METAL

and machine shop and foundry SERVICE GENERALLY. They start or stop as slowly and gently as you please, absolutely without jerk or jar. Any speed operator desires. Will hold the load at any point of the lift and cannot drop load, even should air line break or air supply fail.
If you have hoisting or other problems, requiring hoists, air compressors, cranes, pneumatic or hydro-pneumatic elevators, sand blasts, or overhead trolley systems, give our Engineers an opportunity to help you. Their advice will cost you nothing.

WRITE FOR CATALOG 62 AND NAME OF NEAREST CANADIAN AGENT.

CURTIS PNEUMATIC MCHY. CO. 1585 Kienlen, St. Louis, Mo.
New York Office: 531F Hudson Terminal Building

Combination Brass Water Cinder Mill and Casting Tumbler



1661

Saves 90% of brass contained in ashes, skimmings, etc.

It is also designed for tumbling or water polishing castings.

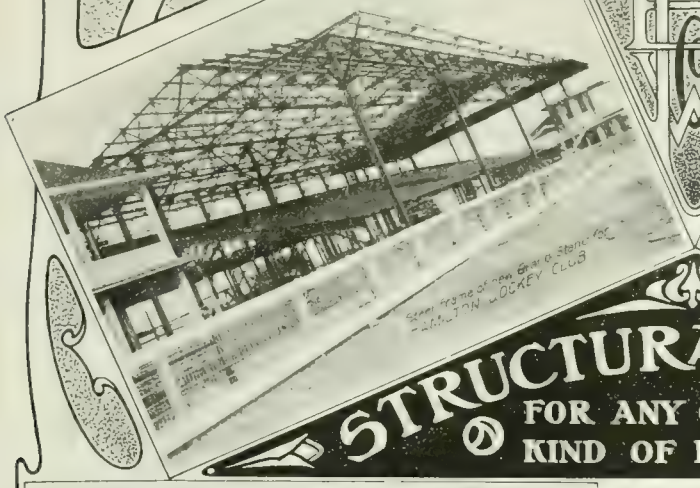
The mill is furnished complete with heavy wood tank, making a complete unit.

Send for specifications.

COMPLETE FOUNDRY PLANTS
Designed, equipped and put into operation.
CRANES OF ALL KINDS.

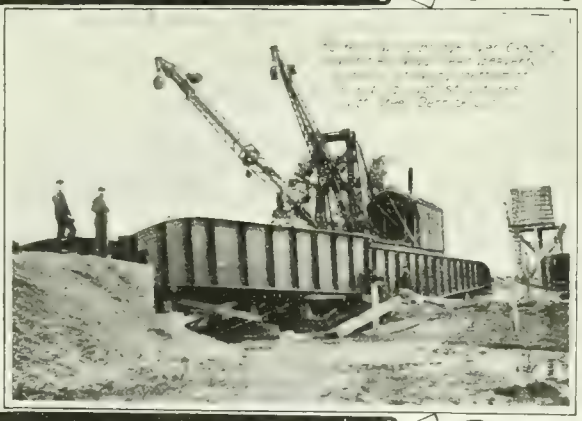
WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

THE
HAMILTON BRIDGE WORKS COMPANY
LIMITED.
HAMILTON
CANADA

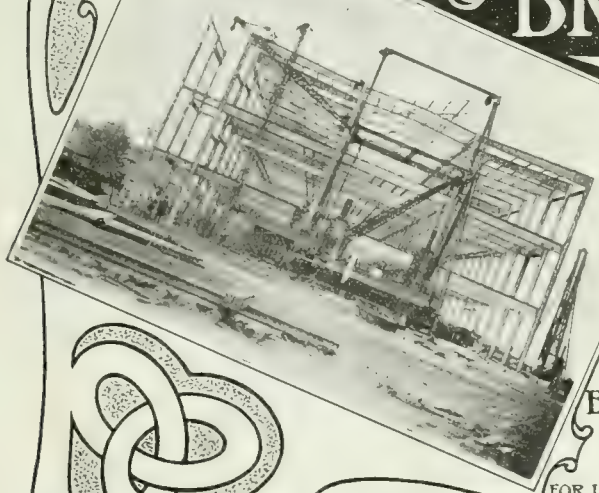


STRUCTURAL STEEL
FOR ANY CLASS OR KIND OF BUILDING

Beam Spans
Pin Spans
Riveted Spans
Swing Bridges
Rivets
Through Spans
Deck Spans
Truss Rods
Drift Bolts
Machine Bolts
Anchor Bolts
Punched Washers
Cast Washers



RAILWAY AND HIGHWAY
BRIDGES



STEEL
COLUMNS.
STEEL BEAMS.
BEAM GIRDERS,
LINTELS, &c.
FOR LARGE & SMALL BUILDINGS

We Solicit Contracts Where Skill in Execution and Technical Knowledge of Design are Important Considerations

GEARS

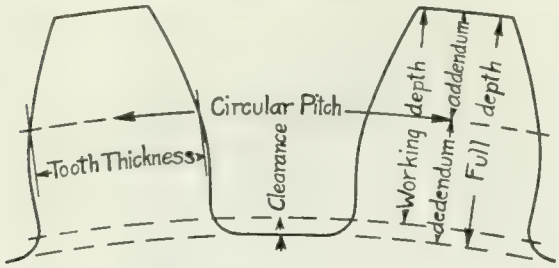
Cut This Out

[More coming each month.

Gear Data for Your Note Book

DIAGRAM OF TOOTH PARTS

From The Hamilton Gear & Machine Co., Toronto



The Hamilton Gear & Machine Co.

Cor. Concord and Van Horne
TORONTO

Brass, Phosphor, Bronze, Copper and Aluminum Castings

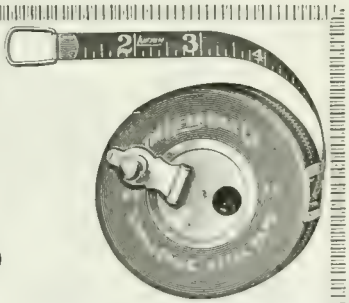
We have the largest Jobbing Brass Foundry in Canada.

Can make prompt delivery.

Tallman's reputation is in the goods.

Tallman Brass & Metal Co.
HAMILTON, ONT.

LUFKIN

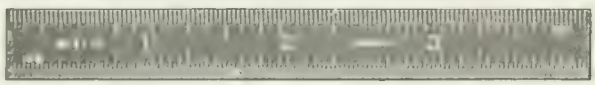


TAPES AND RULES

NOTED FOR ACCURACY

We make a complete line of

MACHINISTS' SCALES — MEASURING TAPES
FOLDING STEEL RULES — WOOD RULES
FOLDING BOXWOOD RULES
SPRING JOINT RULES



Our goods are stocked by prominent hardware and supply houses throughout the Dominion. They are fully guaranteed.

Catalogue on request.

THE LUFKIN RULE CO. OF CANADA, LTD.
WINDSOR, ONT.

ECONOMIC WATER OIL

SHELL MANUFACTURERS use ECONOMIC WATER OIL for METAL CUTTING of every description; it will not gum nor rust, and it SAVES TIME AND LABOR.

WE CAN SAVE YOU 50% in the **COST** of your **CUTTING MIXTURE** BECAUSE

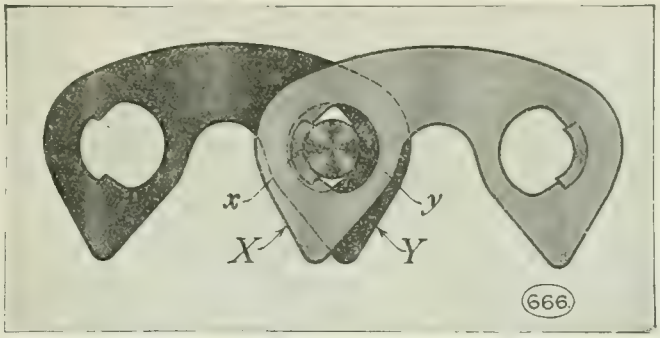
ONE GALLON of ECONOMIC WATER OIL will mix readily with 30 to 50 gallons of WATER, making a thick, creamy emulsion, and giving you a cutting mixture which will not only be **satisfactory**, but will produce very **ECONOMIC RESULTS.**

One TRIAL ORDER will **prove** our STATEMENT.

Made in Canada

CANADIAN ECONOMIC LUBRICANT CO.
LIMITED

1040-1042 Durocher St. **MONTREAL**



Write for descriptive catalogue 5-60

The Unbroken Bearing

in the joint is one of the reasons for the success of the

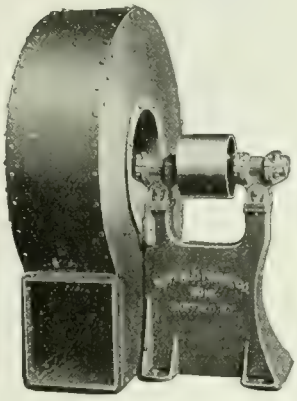
RENOLD PATENT SILENT CHAIN

The links do not come in contact with the pin—consequently the hole will never enlarge and the pin itself is protected all around and over its length.

Sole Canadian Agents:

JONES & GLASSCO (Regd.)

Branch Office TORONTO — ENGINEERS — St. Nicholas Bldg. MONTREAL



Buffalo Slow Speed Mill Exhausters

For Conveying and Removing Shavings, Sawdust, Grain, Dust from Abrasive Wheels, Bark, Smoke, Gases, Fumes, etc.

REDUCE POWER COST 15 to 50%

and run at 35% lower speed than standard fans, decreasing wear and tear, and increasing life of fan and serviceability accordingly.

HOUSING REVERSIBLE, GIVING ANY POSITION OF DISCHARGE DESIRED.
Pulley or motor drive, single or double width.

Let us send you Catalog 256-16.

Canadian Blower and Forge Company, Limited

BERLIN, ONTARIO

St. John — Montreal — Toronto — Winnipeg — Vancouver

Our ELEVATING TRUCK is indispensable in the handling of

Showing truck raised ready to be drawn to destination

Shrapnel Shells

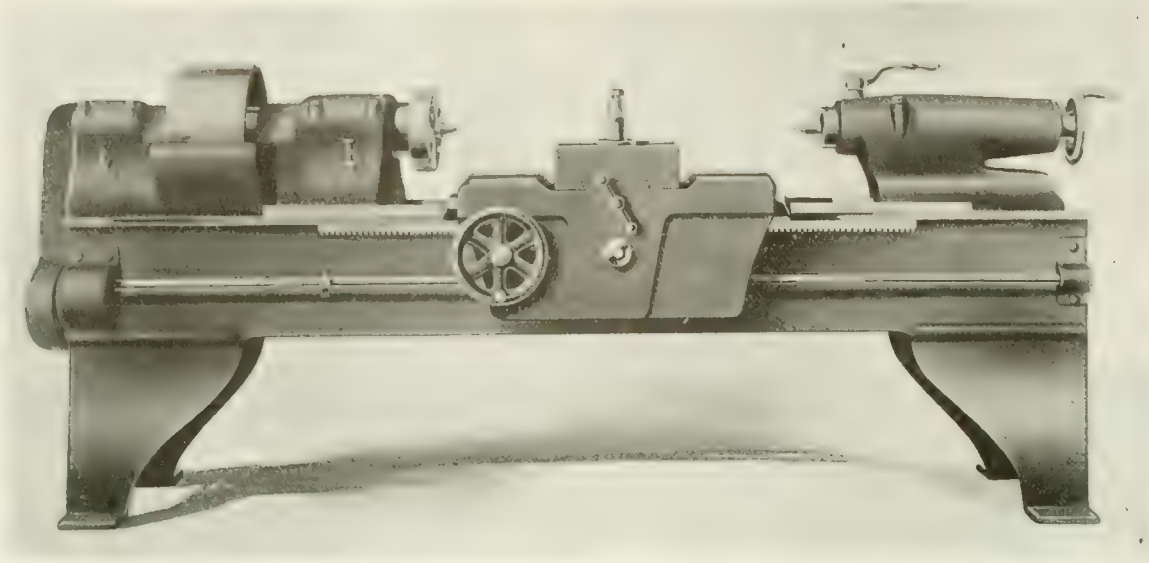
or any factory product where numerous operations are required

We also manufacture **Loading Funnels, Ball - Bearing Tightening Nuts, Belt-Driven Loading Vibrators, Bench Vises,** and **Presses with attachments for pressing in band**—fixtures especially adapted for the manufacture of 18 pr. Shrapnel Shells.

We shall be pleased to submit prices and give any particulars required.

THE CHAPMAN DOUBLE BALL BEARING CO. OF CANADA
LIMITED

339-351 Sorauren Ave. - TORONTO, CANADA



Single Purpose Shell Lathe

A heavy duty lathe for 4.5 and 5 inch shells

The lathe illustrated above was specially designed for shell work. It is built for heavy cuts and feeds and is capable of reducing lathe work on heavy shells to the minimum.

These lathes are exceptionally sturdy, having the belt and bearings of a 26" lathe with the swing of a 16" lathe.

We have a quantity of these lathes on order for prompt shipment.

Let us quote you our exceptionally low prices on these lathes.

Specifications:

Size 16" swing x 8 ft. bed.

Swing over carriage 10".

Spindle bearing, ring oiling.

Front 4½" x 8½".

Rear 3½" x 7½".

Single pulley, 18" x 8".

No. 5 Morse Taper Centers.

Longitudinal Power Feed with Single Automatic Stop, Silent Chain Drive, Slip Gear Feed Change.

Net crated wt., 3850 lbs.

Equipment:

2 centers.

Plain or European Tool Post.

Two Speed Heavy Countershaft.

Extras, if desired:

Power Feed Turret on Shears.

Hexagon Turret on Carriage.

Turret Tool Post.

Forming Attachment.

The Canadian Fairbanks-Morse Co., Limited

St. John, Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Saskatoon, Calgary, Edmonton, Vancouver, Victoria

Canada's Departmental House for Mechanical Goods

The advertiser would like to know where you saw his advertisement—tell him.

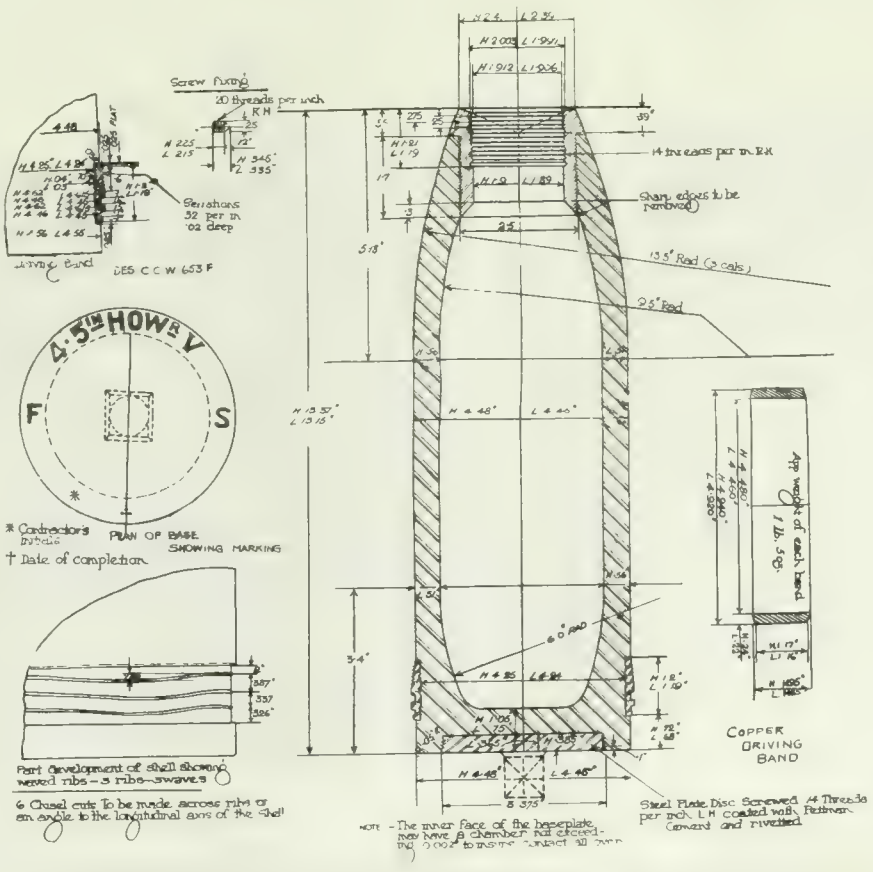
Machining 4.5 H.E. Shells in a Steel Foundry Plant

Staff Article

The sudden call from the manufacture of articles of a peaceful commerce to that of supplying the gods of war with provender of a prodigious amount and such as we never dreamed of producing, has been met by the administrations of our iron and steel industries in a manner that demands whole-hearted admiration for their enterprise, capacity, resourcefulness.

THE forging for a 4.5 howitzer shell is very similar in appearance to that of the 18-pdr. shrapnel, except that it is, of course, of larger dimensions, and being a high explosive shell, the walls are thicker than for shrapnel. As regards the machining operations, the procedure adopted comprices methods used for both the 18-pdr. shrapnel and high explosive shells. The forging being hollow, calls for methods which follow closely along the lines adopted for shrapnel, whereas the later operations conform more to those adopted for the 18-pdr. high explosive, in the matter of the base recess, varnishing, baking, etc. In comparison with shrapnel, a noteworthy exception is the elimination of the heat treatment, this process not being necessary for the various types of high explosive shells. The operation involving the closing in of the shell nose is, however, common to both types, as are also the grooving, waving, copper-band pressing and turning operations.

Notwithstanding the apparent similarity in the operations, as indicated above, the extra size and weight of the 4.5 shell calls for larger and stronger tooling fixtures and in some cases heavier machines. It therefore follows that, in making larger calibre shells, new problems confront even those who may have been successfully making the smaller calibre shells. In the solution of these problems and in overcoming the difficulties encountererd, the prospective manufacturer of 4.5 shells is specially interested. Taken as a whole, the machining of these shells is at present in a more or less experimental stage, but at the plant under review, which, by the way, was one of the first to undertake the manufacture of 4.5 shells, these problems have been surmounted successfully, although in some operations improvements are contemplated with a view to increasing production. In the main, however, the operations to be described later may be said to be of a permanent character.

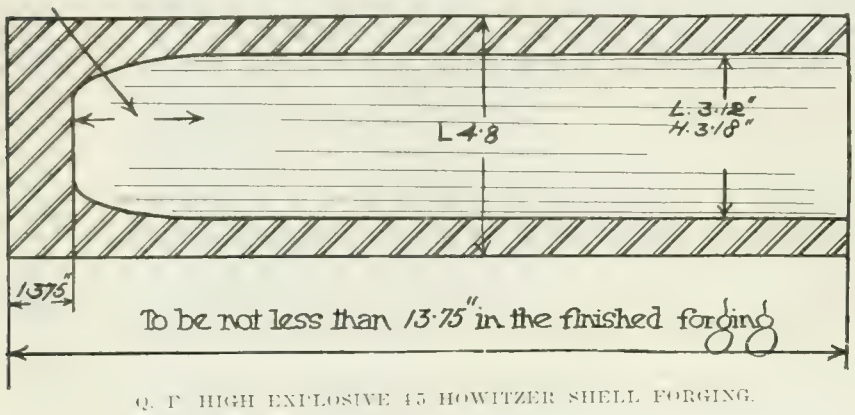

4·5in HOWR V
F
S
* Contractor's Initials
† Date of completion
PLAN OF BASE SHOWING MARKING
Screw fixing
10 threads per inch RH
Serrations 32 per in 02 deep
Driving Band
DES C C W 653 F
14 Increases per in R/H
Sharp edges to be removed
13·5° Rad (3 cals)
25° Rad
60° Rad
COPPER DRIVING BAND
Steel Plate Disc Screwed 14 Threads per inch LH coated with Fettners Cement and riveted
Part development of shell showing waved ribs – 3 ribs – 3 waves
6 Chisel cuts To be made across ribs or an angle to the longitudinal axis of the shell

Q.F. HIGH EXPLOSIVE 4·5 INCH HOWITZER SHELL, MARK V.I., FORMED FROM STEEL BILLET 4.8 INS. DIA. BY 9½ INS. LONG AND WEIGHING 49 LBS. WEIGHT OF FILLED SHELL 35 LBS. PLUS OR MINUS 9 DRS. WEIGHT OF BURSTING CHARGE (TROTYL), 4 LBS.

In the manufacture of the 4.5 shells great care has to be exercised in keeping the weight within the prescribed limits. The feature is, of course, common to shells of smaller calibre, but none the less important for the larger shells. The walls also be of uniform thickness and the shell perfectly concentric. To obtain this concentricity, the shell has a centre drilled in the base, which is retained as long as possible and in all operations involving the removal of metal, the shell revolves in this centre.

An important point to watch is during the nosing operation. After the nose has been heated and closed in, the shell must be put in a place, preferably a steel box, away from any cold draft and allowed to cool

slowly. This avoids the possibility of the shell, which is of 45 to 50 carbon, from hardening at the nose. It is also essential that the threads in the nose should be absolutely accurate; the same remark applies to the base plate or plug. There are only a few threads in the base, but the plug must bottom in the recess, and at the same


This part inside to be forged to enable it to be machined to the finished dimensions
L 4·8
L. 3·12"
H. 3·18"
1375
To be not less than 13·75" in the finished forging

Q. F. HIGH EXPLOSIVE 45 HOWITZER SHELL FORGING.

time be a very tight fit. The reason for recessing the base is, of course, the same as for the 18-pdr. high explosive, to enable the inspector to detect any flaw or "pipe" in the metal at the base, and thus avoid any possible explosion when firing.

Accurate gauging is, of course, of the greatest importance, and high and low gauges are used at practically every operation. With regard to obtaining the necessary weight, a system is followed of keeping the shell overweight until the body is turned to the finished size, the extra metal being left on the base and removed to obtain the required weight. The operations involved in this will be described later.

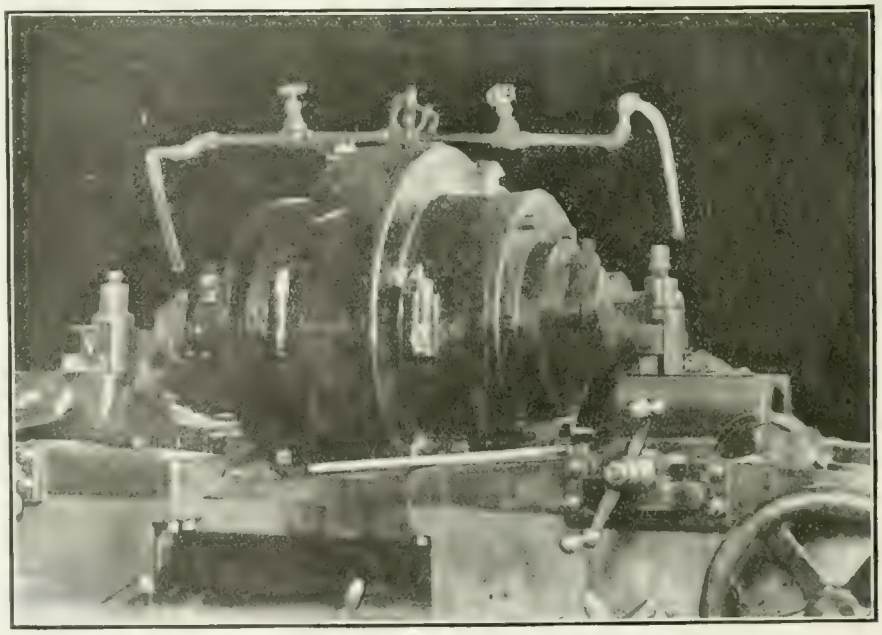
The Forging Feature.

As already stated, the 4.5 howitzer shell is made from a hollow steel forging and not from a solid rolled steel bar, as in the case of the 18-pdr. high explosive shell. The forging is made from a billet or blank 9½ in. long by 4.8 in. diameter and weighing 49 pounds. The ingot from which the blank is obtained is made of cast steel, two blanks being cut from each ingot. After forging, the shell case is 4.8 inches outside diameter and not less than 13¾ in. long over all, the weight, of course, not being a fixed quantity on account of the ragged ends and consequent variation in length.

The finished shell when ready for shipment weighs 27 lbs. 14 ozs., exclusive of the nose cap and explosive charge, while the weight, when ready for service, is 35 lbs., which includes 4 lbs. for the bursting charge. The shell weighs 24 lbs. after the varnishing operation, exclusive of the base plate and nose socket. The over-all length of the shell finished, but without the socket is 12.71 inches. The inside finished diameter of the straight part of the case is 3.406 inches and the outside is 4.46 inches. The base is 15/16 in. thick finished.

Cutting Off Ends.

After the cases have been received from the forge, the first thing to be done is to square up the open end and cut off the superfluous metal. At this plant an axle lathe, made by the Bridgeford Machine Tool Works, Rochester, N.Y., is used for this operation. The illustration shows the drive gear housing in the centre of the lathe and the drive plate, on both sides to which are fastened special clamps for holding the shells. The tool holders are in front on the cross slide. This machine is motor-driven, the motor being located at one end of the bed to the left hand. Before the shells are put in this machine they are marked off on a bench, so that the operator knows how much metal to remove.



CUTTING OFF OPEN END OF SHELL CASING ON AN AXLE LATHE.

Facing Up Base and Centering.

Previous to drilling the centre in the base, the shells are taken to a Bertram planing machine for the bases to be cleaned up. On either side of the table are two long castings with a series of grooves to take the shell cases. The castings are held securely in position by knee brackets bolted to the planer table. The cases are held by clamps, two cases to a clamp bolted to the casting. The planer is equipped with two tools, and a roughing cut only is taken off, sufficient metal being left to permit weight adjustment at a later stage.

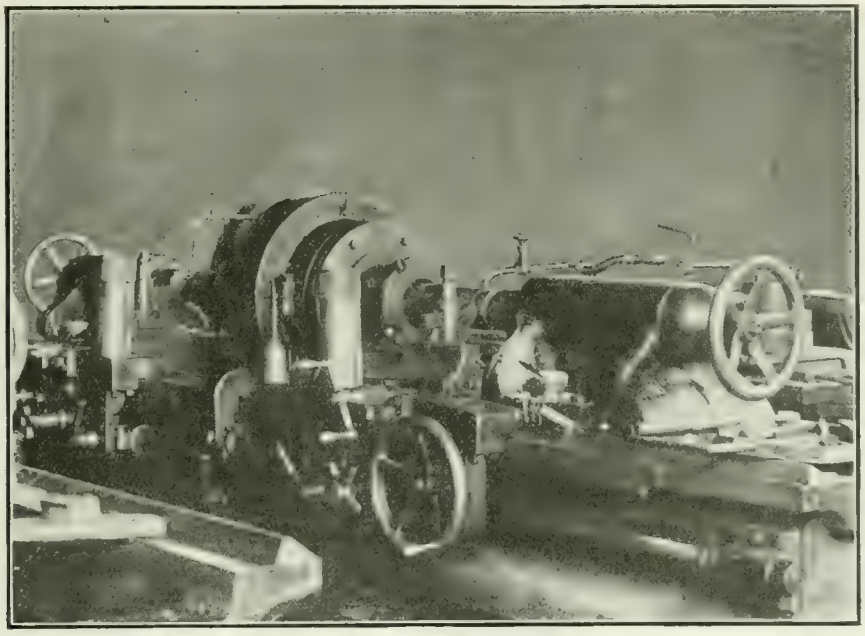
To keep the shell cases as concentric as possible during the subsequent machining operations, a centre is drilled in the base. This centreing is done on an engine lathe, the shell being held on a taper mandril while a countersunk drill is performing the centreing operation.

Rough Turning.

The rough turning operation is performed on a "Bridgeford" axle lathe of the same type as issued for cutting off the shell ends. To each drive plate is attached a self-centreing chuck with a taper stop in the centre for engaging with the open end of the shell. At the face of the chuck outside is a driving ring with four set screws which are tightened up on the shell. The base centre revolves on the tailstock centre. An ordinary turning tool is used and one roughing cut is made. The shell lying on the lathe in the illustration shows how far the machining is carried at this operation, which is equivalent to the length of the straight part.

After rough turning, the base of the shell inside is spot drilled in order to

relieve the cutter when boring at the next operation. A "Bertram" two-spindle drill is used for this work, each shell being held securely in a box chuck or vise fastened to the drill table.



ROUGH TURNING SHELL CASING ON A "BRIDGEFORD" AXLE LATHE.

Inside Boring and Inside Bevel.

The work done at this operation consists of roughing and finishing boring inside the shell case, forming the base inside to the correct shape and forming inside bevel at the nose. The machine used for this operation is a Warner & Swasey turret lathe equipped with a self-centreing chuck and steady rest to support the chuck owing to the long overhang.

The first turret face holds a boring bar with a cutter at the end for boring out the inside for a short distance to give the next tool a better start. The second turret face holds a four lip hogging cutter for roughing out inside. The third turret face has a boring bar with cutter which makes another cut inside and also forms the base inside. The profile of base will be seen in cross section of the shell on another page. The fourth turret face makes the finishing cut inside the shell and also finishes the profile inside of base. The fifth turret face holds a taper cutter for boring the inside bevel to the nose. This inside bevel and the outside bevel also, are formed so that after the nose has been closed in, it is the required shape and size.

Outside Bevel and Facing Base.

Immediately following the operation described above, the shell is taken to an engine lathe to have the outside bevel formed which finishes the preparation of the nose for the closing-in operation. Two engine lathes supplied by the R. McDougal Co., Galt, Ont., are installed for this purpose. Each lathe is equipped with a self-centreing chuck supported by a steady rest attached to the lathe bed. An ordinary turning tool is used. The bevel is 1¾ ins. long and begins 1½ inches from the nose. The accompanying sketch shows the inside and outside bevels and their relation to the nose after closing.

Before being taken to the bulldozer for the nosing operation, the base of shell is faced up on an engine lathe supplied by the American Tool Works Co., Cincinnati, Ohio. The shell is held on an expanding mandril which has a bar in the centre and projection at the end, working against three grips at the front and back of the mandril. When the shell is placed on the mandril it is forced up against the chuck, the inside of the base engages with the bar in the mandril and thus forcing out the grips and holding the shell tight. A roughing cut is taken off the base by an ordinary tool, after which the shell is ready for the nosing operation.

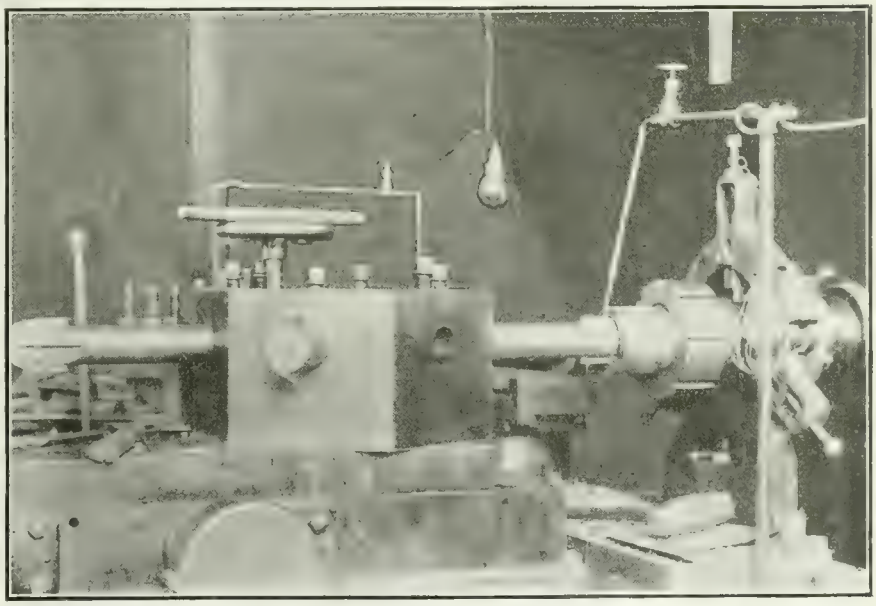
Closing-in of Nose.

The accompanying illustration shows clearly the general feature of the bulldozer used for this operation, and shells resting on the press show the shape of the nose before and after treatment. In the centre of the ram will be seen the die which is conical inside and has a water jacket outside supplied with water through the pipe above. The shell is supported horizontally on a bracket, not seen in the illustration, fastened to the long casting in the foreground.

The nose only of the shell is heated in the oil-fired furnace located on the right. Care is taken that only a certain length of shell is heated, otherwise it might break down in the press. When heated to the required degree, the shell is taken out of the furnace, placed in the bulldozer, the ram of which advances and closes in the nose. The shell is afterwards taken out and placed in a steel box so that it may cool gradually to avoid all possibility of the nose hardening.

Centreing Base.

Before the shell is ready to have the nose finished, a centre is drilled in the base on a drill press supplied by W. F. & J. Barnes, Rockford, Ill. The shell is held in a vise base end up, and a jig is placed over the end to ensure the centre being drilled in the correct place. The



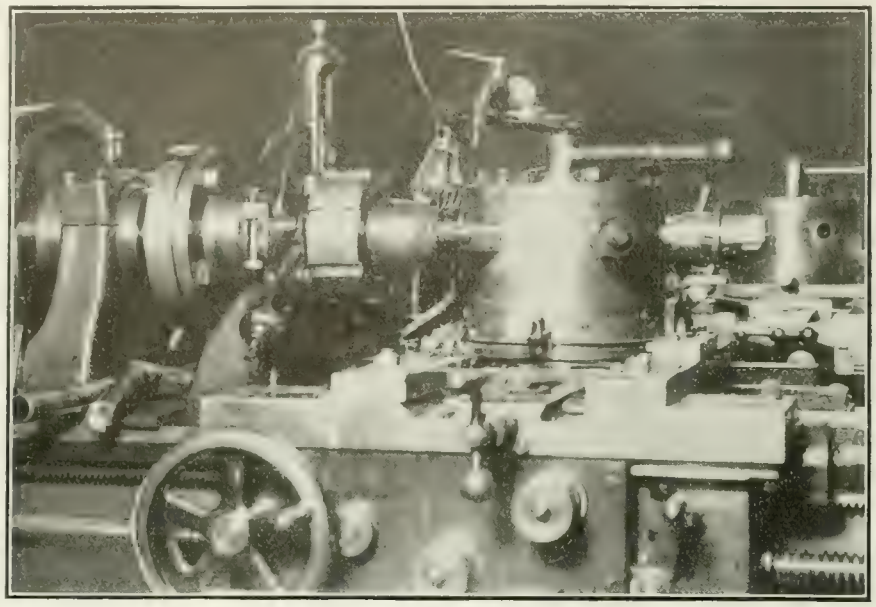
ROUGH AND FINISH BORING INSIDE OF SHELL AND FORMING INSIDE BEVEL.

inside of the nose is now ready to be finished off.

Finishing and Threading Nose.

For this operation one "Walcott" engine lathe equipped with a turret, and two turret lathes supplied by Schumacher & Boye, Cincinnati, Ohio, are installed. All these machines are tooled up in the same manner and are equipped with self-centering chucks supported by steady rests fastened to the lathe bed. The first turret face holds a bar for locating the shell in the correct position in relation to the tools. The bar has a small cutter at the base for cutting the shell to lengths, being gauged from inside base. The second turret face holds a bar with cutter for roughing inside the nose. The next is a bevelling tool for cleaning up that part of the nose inside and beyond the part to be threaded.

The fourth tool is a reamer for finishing the nose previous to threading which is done by a "Murchey" collapsible tap held in the fifth turret face. The shell is now finished inside and is taken to a bench where a pug centre is screwed in the nose to hold the shell in the lathe at the next operation.

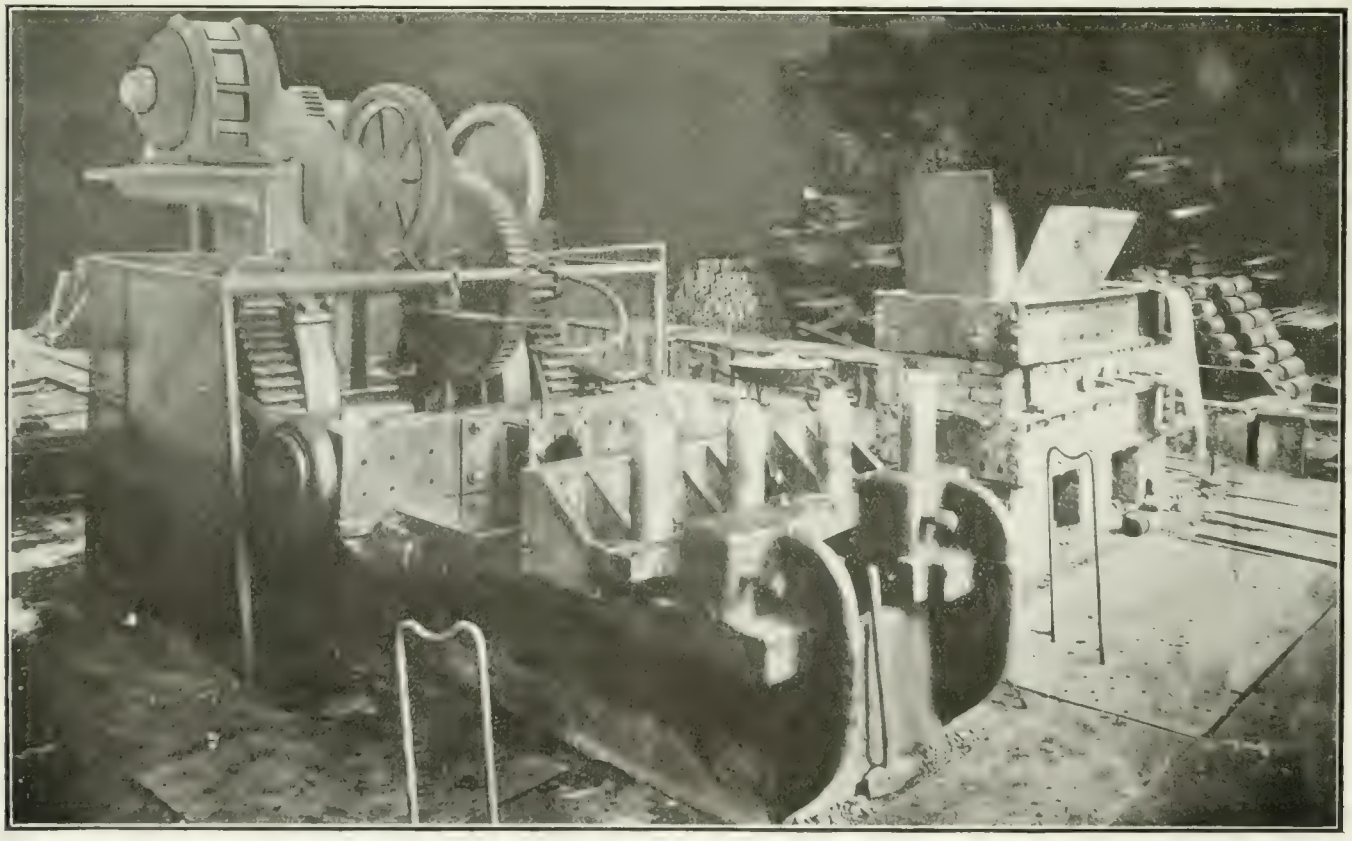


FINISHING INSIDE OF SHELL NOSE AND THREADING SAME.

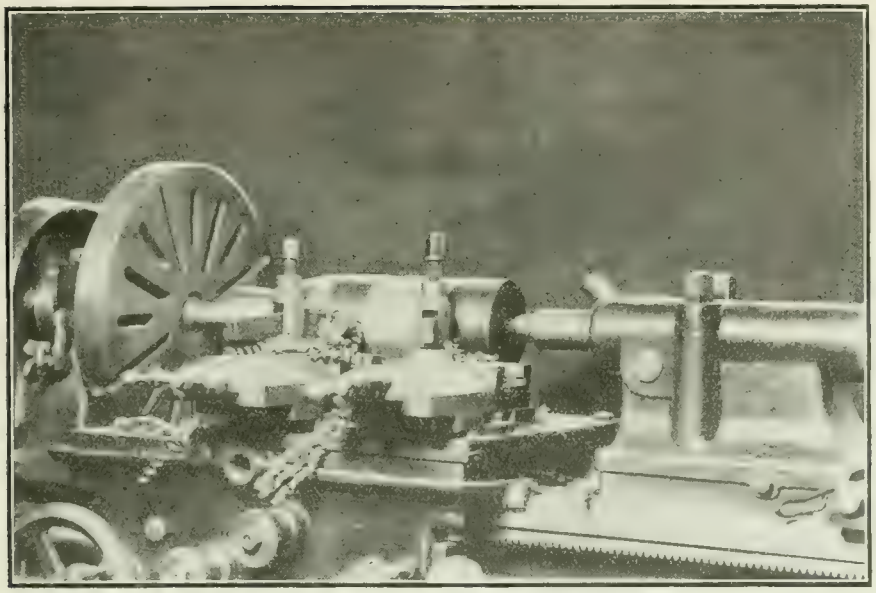
Finish Turning Body.

Five engine lathes built by the R. McDougall Co., Galt, Ont., are installed for finishing the outside of the shell. One of the lathes is equipped with two cross slides and tool holders as shown in the illustration. This arrangement enables two cuts to be taken at a time, thereby increasing production. The other four lathes have only one tool and slide, but are the same in all other respects. The base of the left hand cross slide projects at the back and engages with a cam on a bar fastened to the lathe bed at the back. There is also a weight hanging over at the back, connected to a cross slide to hold the slide bar up to the cam, and so give the correct profile to the nose when the tool is cutting.

In the machine illustrated, the left hand tool turns the nose only and the right hand the straight part only. One tool starts at the nose, and the other at the shoulder, both travelling toward the base. The lathe with only one tool makes but one cut which starts at the nose and finishes at the base. The cam attachment at the back takes care of the nose profile, the same as in the other lathe described. The shell is revolved by a bracket bolted to the face



CLOSING IN SHELL NOSES ON A BULLDOZER. OIL-FIRED NOSE HEATING FURNACE AT THE RIGHT.



FINISH TURNING OUTSIDE OF SHELL

plate and engaging with the square end of the nose plug centre.

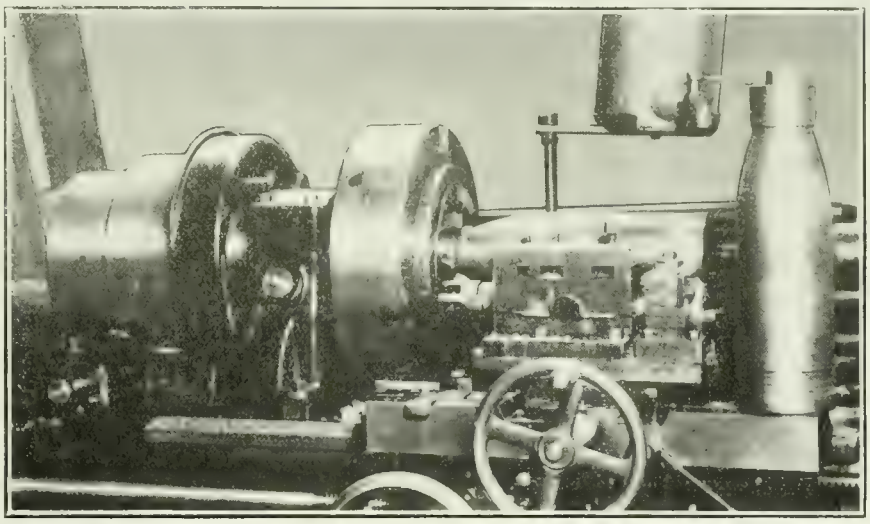
Weight Adjustment.

On the completion of the above operation, the nose plugs are taken out and the shells weighed and inspected. During all preceding operations the shells have purposely been kept overweight in order to be on the safe side, it being easy of course to remove metal but impossible to add any. This extra weight is left on the base and is removed after the amount has been determined by the inspector who weighs and marks each shell before it is taken to the lathe.

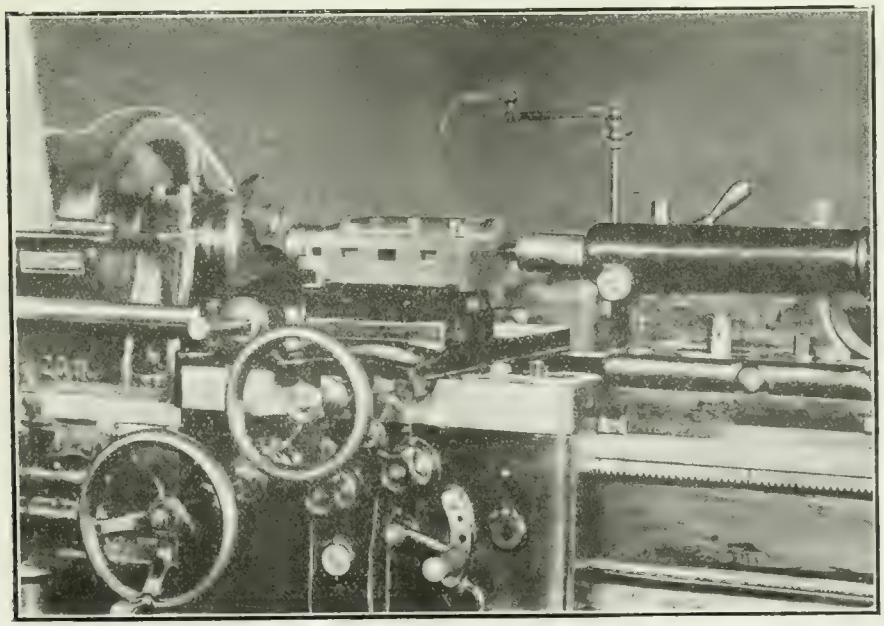
For facing the base to weight, an "American" engine lathe equipped with a universal chuck is installed, and also a "Gardner" engine lathe. This is a plain job and does not call for particular mention. The centre at base has by this time been considerably reduced and so requires making larger. This operation is performed in an engine lathe built by the Bradford Machine Tool Co., Cincinnati, Ohio. The shell is held in a self-centreing chuck supported by a steady rest. The shells are next weighed and inspected, and the nose plugs screwed in again.

Grooving Undercutting and Waving.

It will be noticed from the illustrations that two methods are employed for machining the driving band recess. The principal difference between the two types of machine installed is in the method of oscillating the tool holder when forming the wave lines. In both cases the sequence of operations is the same and the cutting tools are arranged in the same order, viz., grooving, undercutting and waving. The difference is in the latter operation, a cam being used



GROOVING, UNDERCUTTING AND WAVING FOR COPPER BAND ON A C.M.C. LATHE.

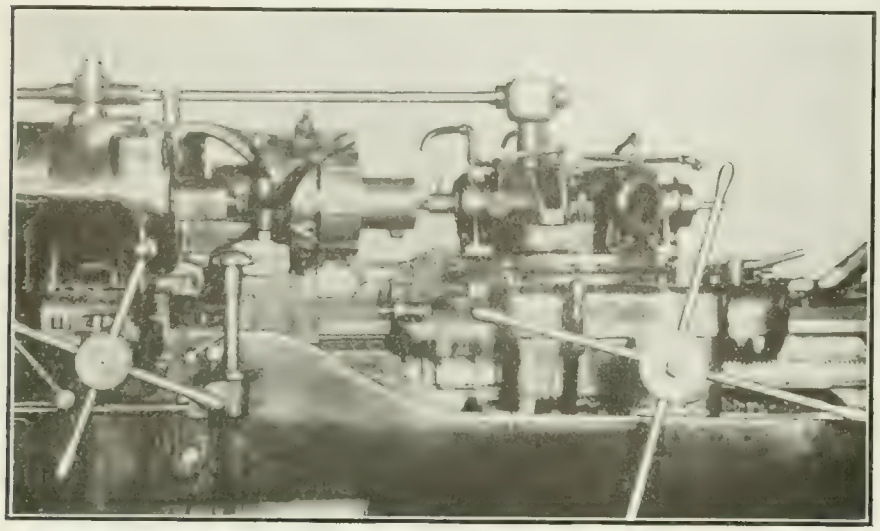


GROOVING, UNDERCUTTING AND WAVING FOR COPPER BAND ON AN "AMERICAN" LATHE.

in one case and an arrangement of shafts and gears in the other machine. Both will be dealt with in detail. The machine installed for performing this work consists of a 20-in. engine lathe built by the American Tool Works, Cincinnati, Ohio, two engine lathes by the Canada Machinery Corporation, Galt, Ont., and one engine lathe by R. Gardner & Sons, Montreal, Que. The "American" lathe is equipped with the special waving gear and the other lathes have a cam, attached to the chuck.

The illustration shows the general arrangement of the "American" lathe which will be described first. A plug centre has already been screwed into the nose, the square end of which engages with an attachement bolted to the lathe face-plate, thus revolving the shell. The tailstock centre engages with the centre at the base of shell. The location of the groove from the

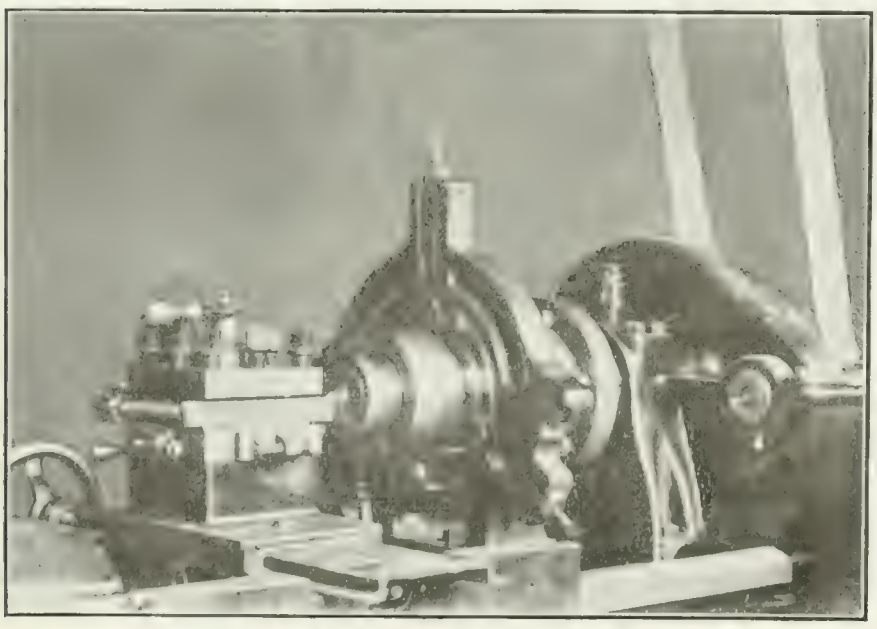
base is determined by means of a suitable gauge. The lathe saddle is moved along until the left hand or grooving tool is in position. The operator then moves the cross slide inwards, thus cutting the groove. The saddle is next moved back until the middle or undercutting tool is in position.



RECESSING AND THREADING SHELL BASE ON A JONES & LAMSON FLAT TURRET LATHE.

This tool has two small cutters projecting outwards diagonally at the same angle as is required for the undercut. When cutting, the saddle is moved along slightly one way until the shoulder of the cutter is up against the edge of outside of the groove, the same method being followed for the other side. The undercutting being completed, the tool is withdrawn and the saddle moved along until the right hand or waving tool is in position. The tool holder for this operation is oscillated by means of the shaft and gears located on the left hand of the cross slide. The shaft is driven by gears in a gear box located at the extreme left of the headstock, and can be put in or out of gear by a lever at the will of the operator. It may here be remarked that this arrangement is only used during the waving operation, and also that the shafts have long keyways and can therefore slide in or out without interfering with the motion of the saddle or cross slide. Three wave lines are cut as against two for the smaller shells.

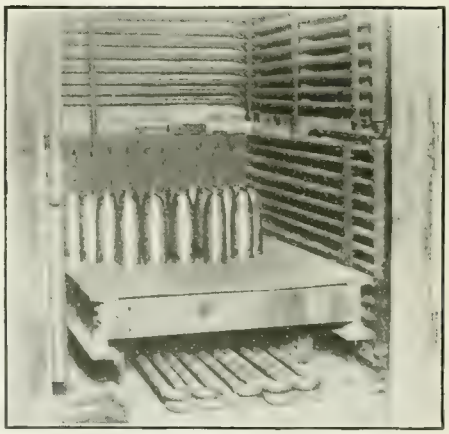
The tooling fixture on the Canada Machinery Corporation lathes, which was designed and constructed by the Canadian Steel Foundries, Ltd., has all the cutting tools at the front, but the waving attachment is separate, and the usual cam being employed for oscillating the waving tool. The shell has the same plug centre but is held in a universal chuck equipped with a three point cam. The method of operation as regards to the grooving and undercutting is the same as for the "American" lathe. The same shaped cutting tools are used and in the same order, it will therefore be unnecessary to describe them again. The illustration shows the wide box tool holder with the tools in the left and right hand slots. The smaller holder to the right hand holds the waving tool which is shown in operation. The saddle is locked and the roller in the round bar running through the larger tool holder is pressed up against the cam which transmits the oscillating motion to the tool; a strong spring under the bar keeps the roller against the cam. The depth of cut is regulated in all cases according to an index on the hand wheel, this being checked by gauges.



ROLLING BASE PLUG AND FACING UP SHELL BASE

Base Recess.

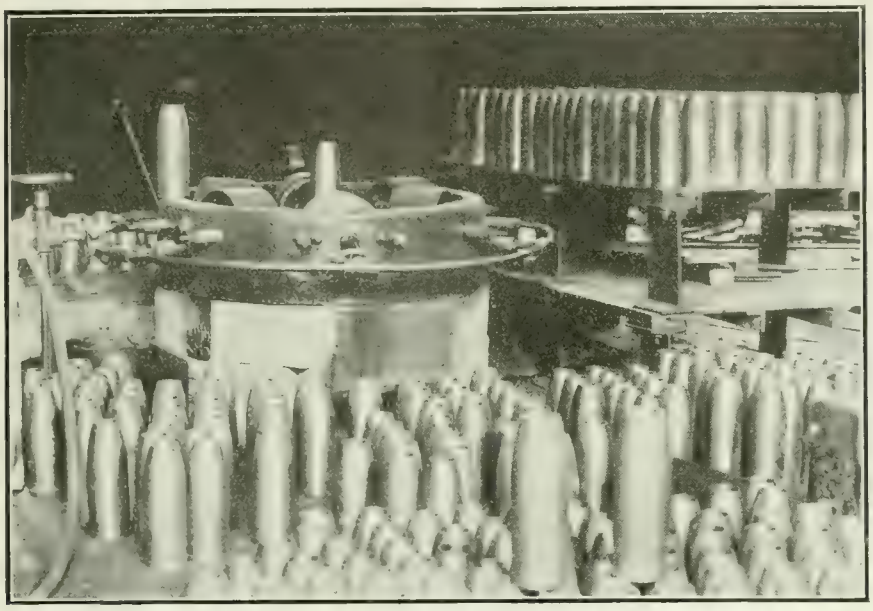
At the next operation, the base is formed and threaded. A battery of six "Hartness" flat turret lathes built by the Jones & Lamson Machine Co., Springfield, Vt., are installed for this work. The ordinary chuck was too light for the work so the machines were equipped with special self-centreing chucks, and, on account of their long overhang, a support in the form of a bracket was devised. The top part of the bracket is fastened to the lathe head, while the lower part rests on and is bolted to the lathe bed. This arrangement holds the chuck steady and prevents vibration. Before the shell is chucked, the plug centre is taken out. In the centre of the chuck is a mandril with a spring at the end. This spring has a tendency to force the shell out while it is being placed into position in the chuck by a swinging arm on the front part of turret. By means of this arrangement the shell is located in the correct position in the machine. The arm when not in use lies flat on the turret bed.



VARNISH BAKING OVEN.

The first tool is a flat drill which is used for obtaining sufficient clearance for the roughing cutter which is held in the second turret and which roughs out the base and sides. In the third turret face is a cutter of similar design to the preceding one, this being used for finishing the bottom of base and side, preparing the latter for the threads. The fourth tool is a cutter for finishing the recesses in the base for the threads to start and finish in. The fifth tool is a chaser for cutting the threads. This is a somewhat delicate operation and requires considerable care. The chasing tool is operated by a special attachment for giving the threads the desired pitch of 14 threads per inch. The lead screw is behind the turret face and the gear box is shown above the turret in the illustration connected to a shaft from the lathe head. The threads in the base are left hand.

The machine head of the lathe is traversed by hand for diameter feeds. A series of bar stops under the head are used for cross or diameter feeds, each stop being set in conjunction with its corresponding turret tool. A similar arrangement of stops is used under the turret for longitudinal feeds.



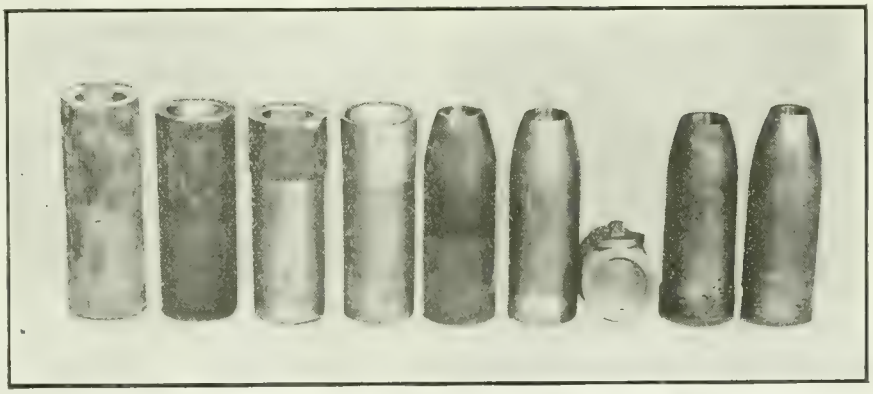
CANADIAN STEEL FOUNDRIES COPPER BAND PRESS.

Inspection, Etc.

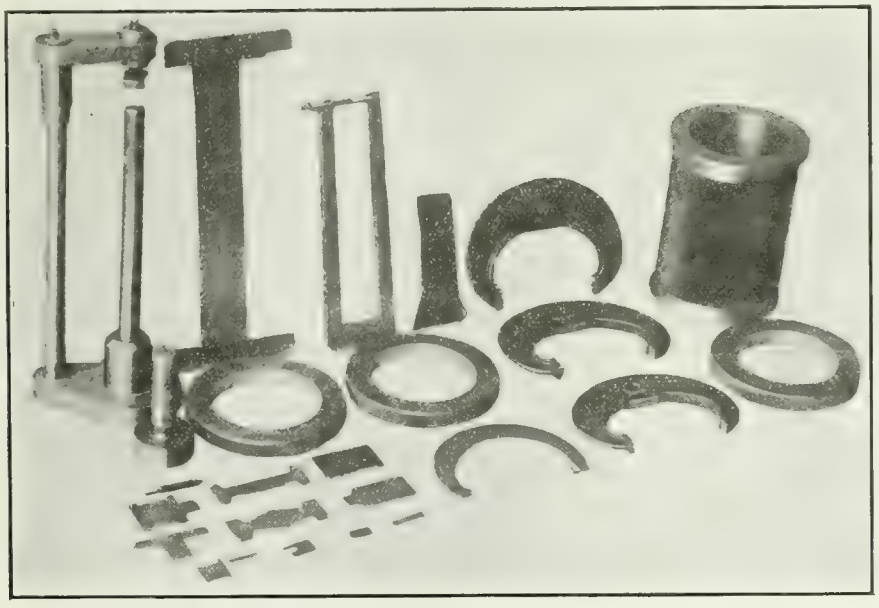
A number of minor operations now follow, the most important being the inspection. The shells are carefully gauged and inspected and then taken to the sand blast where the inside is cleaned and prepared for the varnishing process. The wave lines are next nicked with a cold chisel after which the nose and base recess threads are hand tapped. The shells are then subjected to the preliminary government inspection, the marking being stamped on and the shells arranged in batches of thirty.

Finishing Base.

The plate which is screwed into the base recess is a steel drop forging similar to that used for the 18 pdr., H. E. shell, only of course larger. The base plate is turned on an engine lathe equipped with a special expanding chuck for holding the square head of the plate. The lathe has a turret holding three tools. The first turns the inside diameter in two cuts, the second being the finishing cut for the threads. The second tool forms the camber on the face of the plate, two cuts being made for this. The third turret face holds a tool for cutting the threads on the base plate.



THE 4.5 HIGH EXPLOSIVE SHELL IN ITS VARIOUS STAGES OF MANUFACTURE FROM THE FORGING TO THE FINISHED PRODUCT.



GAUGES USED IN THE MACHINING OF 4.5 HIGH EXPLOSIVE SHELLS.

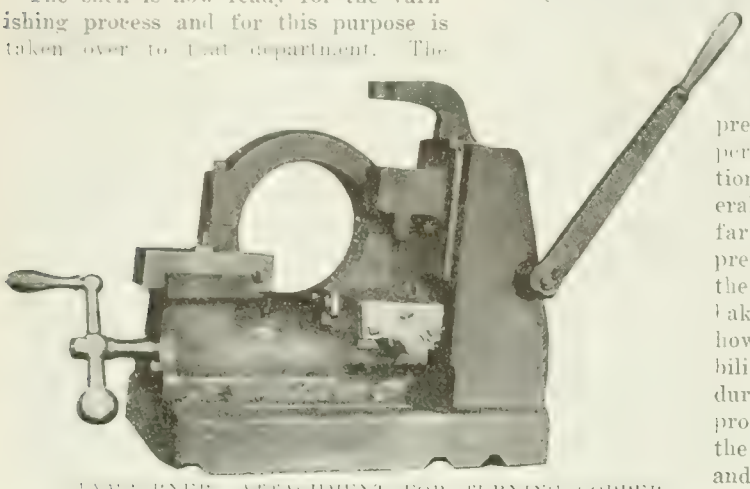
Before the base plates are screwed into the base recess, the threads are covered with "Pettman's" cement. The shell is held securely in a bench vise and the plate screwed in by means of a wrench. Before being taken out of the vise the square head on the base plate is wrenched off.

The base is finished on an "American" engine lathe equipped with an expanding chuck and draw-back mechanism. The chuck is supported by a steady rest as shown in the illustration. The tool holder contains three tools—two cutting tools and a rolling tool. The base plate, which projects slightly

when all the shell is first rough machined, and then faced up by the second tool flush with the base of shell proper. The joint between the base plate and base is now closed by the rolling tool after which the entire base is faced up and finished.

Varnishing and Baking.

The shell is now ready for the varnishing process and for this purpose is taken over to that department. The varnish, it will be remembered protects the inside of the shell from the corroding effect of the explosive. A hollow brass plug is first screwed into the shell nose to keep the varnish from the threads. The shell is filled with varnish which is immediately poured out and the shell placed on a draining rack, leaving only a thin film of varnish all over the inside.



LYMBURNER ATTACHMENT FOR TURNING COPPER BAND.

For the purpose of hardening the varnish, the shells are placed in an oven for 8 hours at a temperature of 300 degrees Fahr. As will be seen from the illustration, the oven is built of brick with wooden doors, insulated with asbestos to prevent radiation. The oven is steam heated and contains steam pipes all around the walls and on the floor. The truck shown in the oven is only a temporary arrangement, as it is proposed to have a truck capable of holding three tiers of shells, which will fill the oven. It will be noted that the baking has preceded the copper band operations. The general practice so far has been to press the band on the shell before baking. There is, however, a possibility of the heat during the baking process expanding the copper band and thus loosening it. This point, however, has not been definitely settled, and as far as equipment is concerned, it is immaterial which operation is performed first.

Copper Band Press.

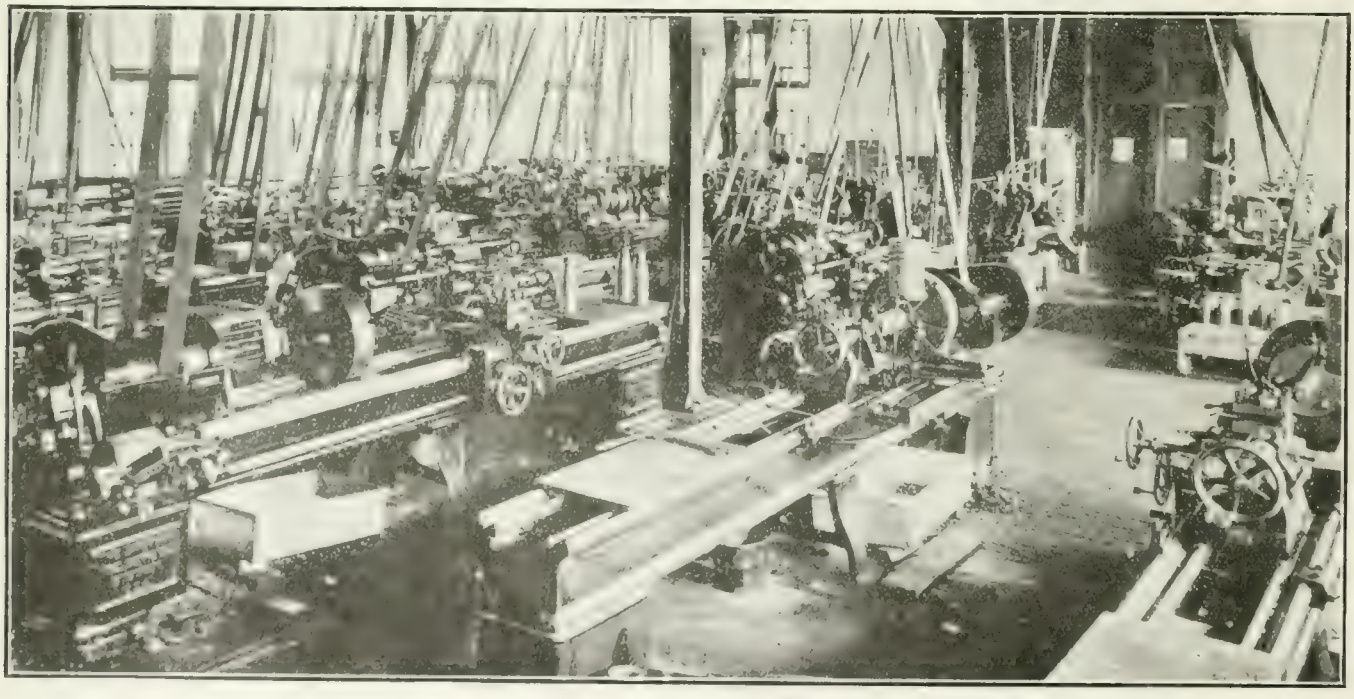
The hydraulic press for pressing on the copper driving band was built by the Canadian Steel Foundries, Ltd., Montreal, Que., and generally speaking it is very similar in design to some other presses on the market, although not quite so high off the floor, an advantage when handling heavy shells. The press has six cylinders which converge towards the centre. The shell with the rough copper band on is placed on the plate in the centre of the press, and the power applied. The pressure is then released the shell given a slight turn and power applied again thus equalizing the pressure on the band. The cylinders are returned to their original position by springs shown outside the press frame.

An engine lathe equipped with a "Lymburner" attachment for turning copper bands is used for finishing the driving band. The attachment is fastened to the lathe bed and has a cross slide in front for the roughing tool and bracket at the back with a vertical slide for holding the finishing tool. The front cutting tool is brought into operation first and the roughing cut made. The back tool is operated by a lever and passes down behind. It is set so that in passing it removes or shaves off the necessary quantity of metal. The cutting tools are of special form to cut the driving band to the required form and also the serrations which are 32 per inch.

Final Operation.

The shell is now complete with the exception of the brass socket. The hollow plug has been taken out and the brass socket screwed in the nose. These sockets are practically finished when they are received at the plant, and the only machining to be done after being put in the shell is to turn the outside of the socket to conform to the profile of the shell nose. The work is done on an engine lathe.

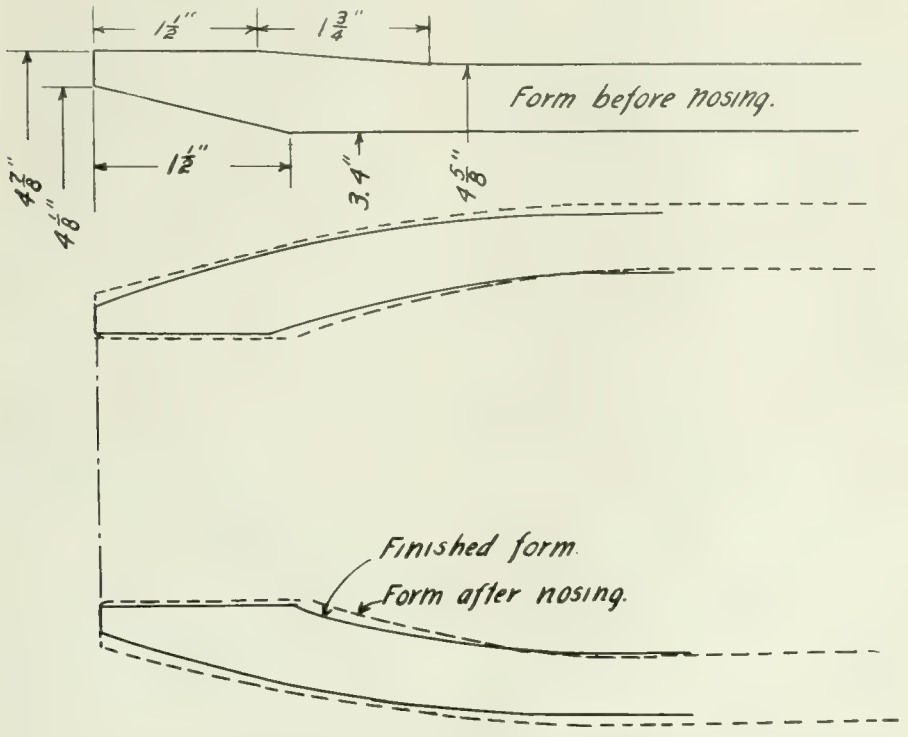
Between the various operations where it has been necessary to move the shells



GENERAL VIEW OF MACHINE SHOP, SHOWING SHELLS IN PROCESS OF MANUFACTURE.

any distance, they have been moved in boxes holding lots of thirty. These boxes are raised off the ground to allow of their being moved by the "Chapman" elevating and transveying trucks, several of which are in use at this plant.

The shells now undergo the final government inspection, and are carefully



OPEN END OF SHELL FORM BEFORE AND AFTER NOSING. DOTTED LINES SHOW MACHINING REQUIRED BEFORE THREADING NOSE.

weighed and gauged, one of each series being selected for the firing test. They are then painted, dried and packed for shipment.

List of Gauges.

Thickness of base (finished).
Length of body outside (finished).
Thickness of walls.
Radius of head of shell.
Diameter of driving band.
Cylinder gauge.
Threads in nose.
Diameter driving band, high.
Diameter driving band, low.
Diameter of body, h. & l.
Diameter of body, low.
Diameter of waved ribs, h. & l.
Diameter of recess in driving band.
Form of driving band.
Shape of nose on shell body.
Fixing screw hole and threads.
Width of driving band and distance from base.
Fuse hole recess.
Diameter and shape of socket head.
Depth of base plate recess.
Width of driving band recess.
Height and shape of wave ribs.
Distance of fixing screw hole from top.
Shape of serration.
Undercut in driving band.

POST BELLUM COMPETITION.

AFTER the war, competition with Germany is to be more severe than before, and it is imperative for American manufacturers to cut their costs to the bone, and do it in a hurry. Such is the view expressed in a recent address by Robert Grimshaw, consulting engineer and lecturer in New York University, who, although an American citizen, lived many years in Germany. He has come from that country within a year, and is thoroughly familiar with conditions in Germany and the United States.

Mr. Grimshaw says that after the war there will be in Germany alone at least two million men who will return home and find that they have no jobs. Some of them will see that factories where they worked before the war have been closed, and some of them will discover that their jobs have been filled by women and children. Mr. Grimshaw believes that these men will be put to work at about 50 cents a day, and that the product of their hands is going to be dumped upon this and other countries. He also says that there is a large class of work being done now in Germany, but the product cannot be shipped on account of war conditions. He believes that as soon as peace is declared and ships are free to travel without being molested, this product of the war period will also be dumped in the United States and other countries now at peace.

These are statements worthy of the most careful consideration by everyone who has at heart the welfare of our work people. In discussing the question as to what is to be done about it, Mr. Grimshaw says that the tariff is usually made by people who do not know anything about it, or else by those who know too much about it and consult their own interests instead of those of the general public.

There is a great deal of truth in this statement, and it is high time to begin a scientific investigation to determine as nearly as possible what kind of a tariff bill should be enacted. This should be done by a non-partisan commission, and done thoroughly. Then when the war ends, we shall have at hand a mass of facts of great value as a guide in quickly passing a tariff bill, if a revised tariff is not placed upon the statute books before peace is declared.—Iron Trade Review.

NEW FACTORY INSPECTION REGULATIONS.

THE twenty-seventh annual report of the Factories Inspection Branch of the Ontario Department of Agriculture has been issued. It shows that 10,059 inspections of factories and shops were made during the year in 410 cities, towns and villages. The number of accidents reported are 1,270 of which 52 were fatal.

Regulations regarding specifications for fire escapes are given with illustrations, together with a most practical article on how to lessen fire dangers. There are also helpful suggestions regarding ventilation and general sanitation, guarding of machinery, child labor, seats for females in shops, and wearing of girls' hair in mills and factories. Results are also given of the inspection of bake shops, canning factories and evaporators. Special emphasis is placed upon eye protection in certain occupations. In fact "safety first" is urged upon every possible occasion. A most suggestive feature of the report is a series of danger signs in which warnings are given in nearly every foreign language.

Bright Whitewash.—Half a bushel unslaked lime; slake with warm water, cover it during the process to keep the steam; strain the liquid through a fine sieve or strainer; add a peck of salt, the same to be previously well dissolved in warm water; add 3 lb. of ground rice boiled to a thin paste, and stir in boiling hot; add ½ lb. of glue which has been previously dissolved over a slow fire, and add five gallons of hot water to the mixture; stir well, and let it stand for a few days, covering up to keep out dirt. It should be put on hot. One pint of the mixture, properly applied, will cover a square yard. Small brushes are best.

The Design and Constructional Features of Plug Gauges--I.

By C. Hattenberger

The application and maintenance of proper plug gauges for certain lines of manufacture mean greater efficiency and interchangeability. Where a large number of similar pieces are required, suitable gauges are most essential, and should be provided.

PLUG gauges are being used in altogether too few instances, and those who are not familiar with them in inspection work in large plants would hardly dream of the rapidity with which they can be used and the work accurately measured. There are two types of plug gauges—the standard reference plug gauge and the limit plug gauge. Where holes are produced in large quantities the limit plug gauge is to be preferred, because greater interchangeability is secured, and there is an increase in production on certain lines of work. When only a small number of holes are to be measured, it will in some cases suffice to use a temporary gauge made from soft machine steel. For small gauges up to one inch in diameter, tool steel should be used, and for the larger sizes a good quality of machine steel, suitably case-hardened, answers the purpose admirably.

It is good practice to allow the gauge to season before grinding it to size. For most manufacturing purposes lapping is not necessary; a gauge from the grinder should be sufficiently accurate for all practical purposes. Some shops in an endeavor to save expense use soft steel handles and make the measuring part of the gauge of a good quality of high carbon tool steel. This economy is sometimes carried too far; so little material is really saved that the saving on material is more than outweighed by the extra amount of labor required.

A set of standard reference gauges should be kept in the tool-room and used only when checking or making new gauges. A record should be kept of all gauges. Before designing or making a plug gauge, it is essential that the following points are considered:

Reflective Features.

1.—If a standard plug gauge is required, would it be cheaper to buy the gauge?

2.—Is a standard plug gauge or a limit plug gauge best adapted for the work?

3.—If a limit gauge is decided upon, are the limits correctly determined?

4.—Is the gauge to be used on one or more operations?

5.—Can attachments be added to the gauge that will extend its usefulness?

6.—Can the gauge be quickly inserted and removed?

7.—Are all necessary corners rounded?

8.—Is the gauge absolutely foolproof?

9.—Have you specified the material to be used for the various parts?

10.—What parts are to be hardened?

11.—Is the gauge awkward to handle?

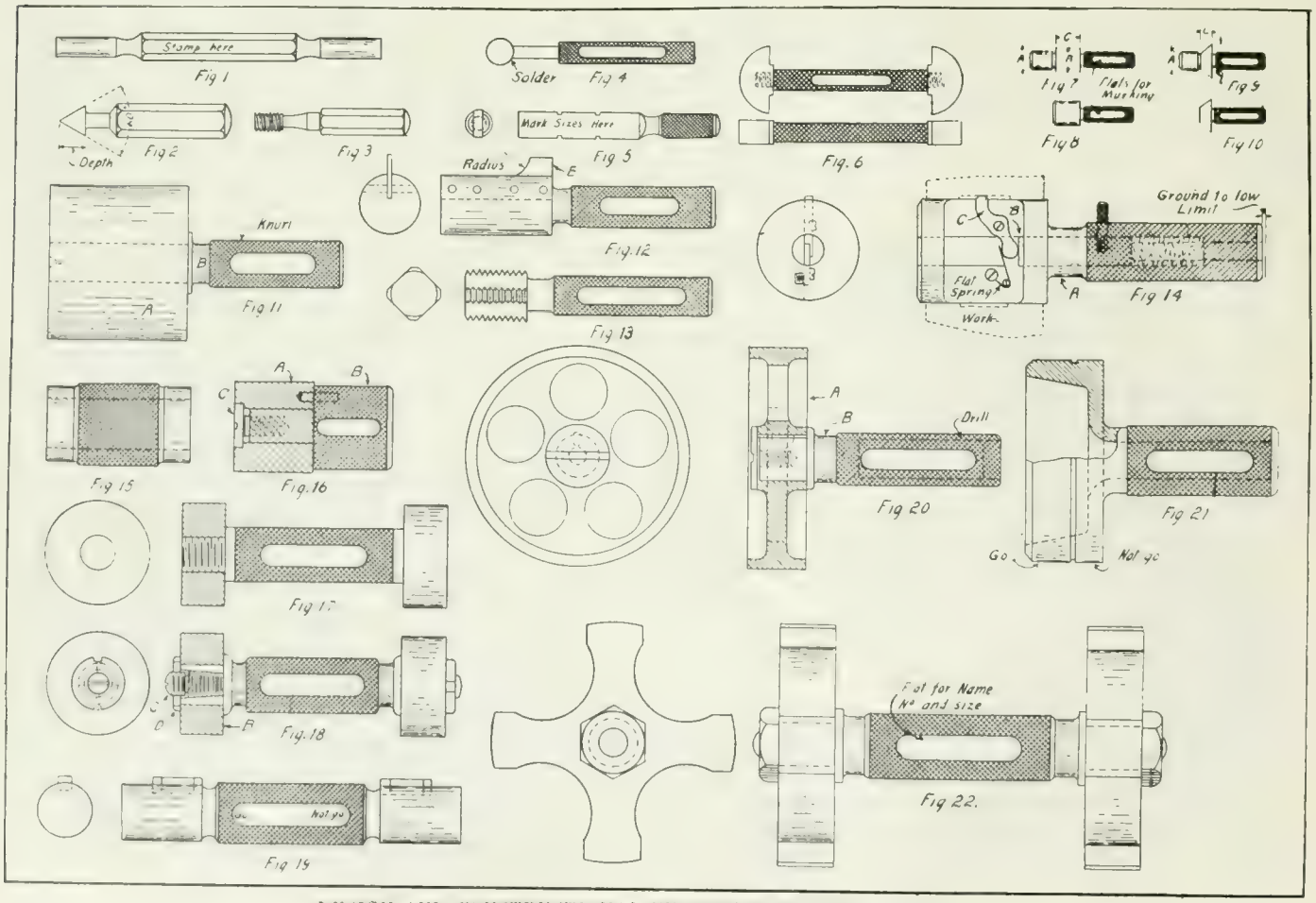
12.—If the gauge is too heavy, can it be lightened by changing the design?

13.—Is it cheaper to make a separate handle of soft machine steel?

14.—Can the handle be used on more than one gauge?

15.—Would a hollow handle be best?

16.—The handle should be knurled, if possible, and a flat provided for stamp-



DESIGN AND CONSTRUCTIONAL FEATURES OF PLUG GAUGES.

ing the name, number, and size of the gauge. Have you specified this in the drawing?

17.—Chamfer the ends of straight plug gauges slightly to insure easy entering.

18.—If the gauge is to be used in a blind hole, provide an air vent.

19.—Provide dirt grooves on thread plug gauges.

20.—Don't fail to remember that a highly-finished thread gives the best wearing qualities.

21.—If a taper hole is to be measured, can you use a plain or an indicating taper plug gauge?

22.—If an indicating gauge is decided upon, are the graduations spaced far enough apart so they can be plainly seen?

23.—If the hole is a large one, can a pin or rod gauge be used to better advantage?

Although plug gauges are most frequently used for measuring holes, their use can be extended considerably, as will be shown in the illustrations.

Small Plug Gauge.

Fig. 1 shows a limit plug gauge very much in use in typewriter, sewing machine and gun factories. It is usually made from bar tool steel of either hexagon or octagon shape. When large quantities of these gauges are used, it is very often the practice to turn and centre them in a hand-screw machine, and after being hardened they are finished in a cylindrical grinder. The reason for using steel of the shapes mentioned is to afford a firm grip for the hand and save the expense of knurling.

Centre Gauge.

The gauge shown in Fig. 2 is used to measure the depth of centres in the ends of shafts, etc.

Thread Plug Gauge.

In Fig. 3 is shown a thread plug gauge that can be used to advantage on small tapped holes. The threads should be left about .001 of an inch large; then after hardening they can be finished with a cast iron or copper lap charged with fine flour of emery or diamond dust.

For Small Holes.

For measuring small holes requiring great accuracy the gauge shown in Fig. 4 answers the purpose. It consists of a standard steel ball soldered to a machine steel handle. Only solder of a low melting point should be used. Points in favor of this type gauge are that no care is required to start the gauge straight, as is the case with a cylindrical gauge, and, if a ball shows signs of wear, it can be quickly replaced at small expense.

Fig. 5 is a limit gauge for measuring small holes. Two flats are milled to lighten it and provide a smaller measuring surface, a feature which is very often desired. The sizes are minimum and maximum on the ends and exact size in the centre.

Keyway Gauge.

In Fig. 6 is shown a Woodruff keyway limit gauge, consisting of a soft steel handle, having threaded ends, to which are fitted the measuring blocks. A gauge of this kind checks the width and depth of the keyway.

For Fillister Head Screws.

Figs. 7 and 8 show gauges used in gauging the size drill and counterbore of fillister head screws, A representing the body diameter of a fillister head screw, B the diameter of the head, C the length of head or depth of counterbore.

For Countersink Screws.

Figs. 9 and 10 show gauges used in gauging the size, drill and countersink for flat head machine screws; A represents the body diameter of a screw; B is the diameter, and C the length of the head. The angle of the head being 70 degrees, included angle.

Large Plug Gauge.

The amount of tool steel entering into the construction of the larger size plug gauges is no small item. Any scheme that will effect a saving in this direction is worthy of consideration. Fig. 11 shows how this may be done. The tool steel ring A is bored to about .002 of an inch smaller than the shank of handle B, which is made of soft machine steel. After the ring A has been hardened, it should be immersed in boiling water and allowed to expand. The handle can now be inserted into the hole without difficulty. After cooling, the ring will be securely held on the handle. It may now be ground to size, using centres provided for that purpose in the handle. When the gauge has become worn, it can be removed, annealed, and used for the next size smaller.

Radius Gauge.

An efficient means for measuring the radius at the mouth of a hole is found in the gauge shown in Fig. 12. It consists of a plain plug gauge, having a slot to which is fitted the hardened steel piece B, having the correct radius. This is firmly secured by means of the dowel pins shown in the illustration.

Relieved Thread Plug Gauge.

A feature that will be found of value in connection with thread plug gauges is shown in Fig. 13. Four flats are milled to provide space for oil and chips. Holes tapped in cast iron retain considerable oil and chips. Under conditions of this kind gauges of this type are the only kind that can be used to advantage.

Recess Gauge.

The gauge illustrated in Fig. 14 is used for gauging the depth of a recess. The plunger B is held against a bell crank, C by the action of a spring, on the end of the handle, A is ground a step that shows the limit within which the work must be machined. The end of the plunger is required to come within the step when applied to the work. A small knurled handle is provided to facilitate the entry and removal of the gauge.

Short Limit Gauge.

On turret lathes the space between the tools and the work is often very limited. For such conditions the double-ended limit gauge shown in Fig. 15 was designed. It will be noticed that its length is short compared to the diameter. A hole extends through the gauge for the purpose of reducing its weight.

Convertible Plug Gauge.

Another gauge designed for turret lathe use is shown in Fig. 16. It consists of a hardened and ground ring A, having a hole its entire length and counterbored to receive the screw C. The handle is made of machine steel, and carries a pin, D, which prevents part A from turning. Additional rings of various sizes can be made to fit the same handle, thereby reducing costs appreciably.

Built up Limit Gauges.

Fig. 17 shows a simple method of constructing a double-ended limit gauge. Two hardened steel discs are screwed on the threaded ends of a machine steel handle.

The form of gauge shown in Fig. 18 costs more to manufacture, and possesses no advantages that would warrant its adoption in preference to the gauge just described. Referring to the illustration, it will be seen that the ends of the handle A are threaded taper to receive the expansion screws, C; these are held in place by the lock nuts, D. The measuring discs B are made of tool steel or machine steel suitably carbonized.

Keyway Testing Gauge.

Fig. 19 is a gauge used for testing the proper location of keyways. Each end is a plain plug, to which is fitted a ground steel key, having the proper limit, and secured by screws or solder. All parts should be hardened.

Extra Large Gauges.

When a plug gauge gets over 3½ inches in diameter, weight is a factor to be considered, and calls for alteration in the design. An example is shown in Fig. 20. The measuring disc (A) is grooved out on the faces, and five holes provided, as will be seen in the illustration. The handle (B) is held by means of the key and screw shown.

Single End Limit Gauge.

A good example of a single end limit gauge is shown in Fig. 21.

Relieved Limit Gauge.

Another form of limit gauge is illustrated in Fig 22. This type can be laid on the machine or bench without rolling off. The discs are secured by means of a nut screwed on each end of the handle.

REFINEMENTS IN MECHANICAL DRAWING.

By James E. Cooley.

THE symbols and conventional methods used in mechanical drawing have been so long established that drawings as a rule have undergone very little change and improvement compared with other systems and practices relating to the machine industry. The most of us are familiar with an advertising phrase that runs something like this: "We could not improve the goods, so we improved the package." This may not have a direct application to a drawing, but it serves to show that while a limit may be reached in improving a certain article, it is possible to go a point beyond and refine something in connection with it. This is true of mechanical drawings, machinery, or even man himself.

Refinement of Individual Detail.

A doctor may be a first-class surgeon, by his skill and ability may have reached a high mark in his profession, but, beyond his skill and ability, though he may go no further, it is possible for him to refine his methods in the handling of his cases or whatever relates to his respective calling. Such is true of the draftsman and the drawings he makes; he cannot perhaps improve the symbols or methods in use, but it is possible to refine the arrangement of these so that his drawings will have a neater and better appearance.

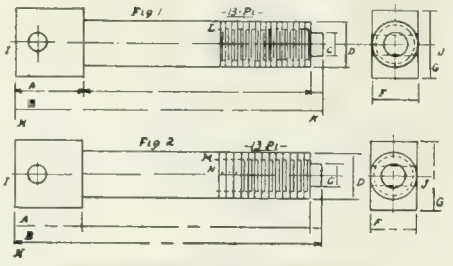
Omissions and inaccuracies are to be noted more or less on mechanical drawings, but it is not to be assumed by this that the average draftsman is careless. In many cases he is a hurried individual, produces work that has a hurried appearance, he is subject to others "higher up," and not allowed time to produce drawings with any semblance of finish or neatness of execution.

Drawings a Necessary Evil?

An impression has gone forth and has gained widespread publicity that drawings are a "necessary evil." Nothing is further from the truth and sense in a report of this kind. That which is vitally important as an aid in producing work accurately and economically cannot be an evil. The evil would be in trying to machine or fit a piece of work without the aid of a drawing. It is poor economy to rush or try to cheapen work in the drawing-room in order to save time and expense in this particular branch of the machine tool industry. It is not uncommon to see drawings, such as pencilings, taken direct from the drawing board and used, with edges untrimmed, having no border lines, superfluous lines unerased, or even blueprints in use that have not been given proper time for exposure, the color being so mottled that the lines and figures are hardly readable. On this principle of doing work, one might assume that the machine work was being produced in the same manner or on the same scale.

Average Drawing Imperfect.

However, it can be said with truthfulness that no matter how much pains have been taken, the average drawing is a poorly executed affair. This may not be discernible to the user, it may not be noticed even by draftsmen, but it can be shown on examining any drawing that the proper finish as regards symmetry, or the proper placing of certain lines, figures, etc., in their relation to each other has not been or never is given any consideration. The two views of a special stud, Figs. 1 and 2 that accompany this article, show clearly a few important points either unknown or overlooked by draftsmen and others, but which if kept in mind and practised would add



REFINEMENTS OF MECHANICAL DRAWING.

considerably to the general appearance of a drawing.

The first to be mentioned are the dimension lines. These are usually placed on drawings with little attention to order or arrangement. Note the lines A-B, Fig. 1, unevenly spaced from the stud-head. See same lines in Fig. 2, placed an equal distance apart. Note again the lines C-D, Fig. 1, between the end of the stud and side of stud-head, and the same lines below evenly placed across this space. Also see lines F-G, Fig. 1, denoting thickness of head; these are badly spaced. How much neater they appear as placed in the figure below. A fault common to many draftsmen is to draw witness lines one longer than the other at each end of a dimension line, as seen at H-K, Fig. 1, also in several other places in this figure. All the witness lines in Fig. 2 overhang equally from the dimension lines.

Centre lines as usually drawn have a hit-and-miss appearance, because the lengths of the dash lines are seldom alike. It is also noticed that the ends of the line as at I and J, Fig. 1, terminate unequally from the views. In Fig. 2, this centre line is evenly spaced, both in the dash and dot, and terminates alike at the end of the two views through which it passes.

It might be said here that, ordinarily, draftsmen cannot take the time to put all these finer touches to a drawing. It does not require any extra time; it is done with the eye, by practice and by taking pains. It is simply the difference in being methodical in one's work or slipshod.

Attention is further directed to making arrow-heads. These should be slightly curved and darkened so they will show up plain on a blueprint. Those often shown, as in Fig. 1, resemble a "pick-axe" as much as they do an arrow-head.

Screw Threads.

Lines representing threads should be spaced off with dividers, because the number of threads per inch are either exceeded, or not enough are shown when guessed at with the eye. The lines showing the depth of thread are as a rule drawn uneven, which appear zig-zag as indicated by the dotted lines L, Fig. 1. It is an easy matter to draw two pencil lines as M, Fig. 2, and make all these thread lines equal lengths, giving the drawing a much neater appearance. Small dots made with the pencil as suggested at N, Fig. 2, will aid the draftsman in drawing these inner thread lines central between the outer thread lines.

Enough has been said here to show in a general way what constitutes the making of a first-class drawing, being simply careful attention given to each detail. The inch marks should be an equal distance on all figures, the border lines should be the same thickness on all sides, the drawing should be evenly trimmed off on the edges, and so on. Such painstaking care will show its mark where careful attention is given to the smallest of these details, and will add wonderfully to the neatness and general appearance of a drawing, all of which may be rightly called refinements.

When a handful of rags, paper, cotton or wool are soaked with oil or varnish (especially drying oils) and are thrown in some place where they cannot get much air, they may be expected to take fire sooner or later. A little dampness makes them take fire quicker. They make heat by themselves. The heat gets greater, little by little, and the more porous the stuff the oil is on, the greater the surface of oil exposed to the air, if the amount of oil is not large enough to fill the pores completely. If there is sawdust around, probability of fire is increased. Why these harmless looking oily rags should take fire by themselves is something that only chemists can explain. It does not matter how this strange thing happens, but it does happen, and that is all we need to know for our purposes. The thing is to get rid of the rags, and not throw them in corners or under machinery.

The Successful Production of Large Steel Castings

Staff Article

The development of certain branches of mechanical and electrical engineering during the last decade has compelled foundrymen to strain every effort in order to keep pace with the ever-increasing demands of machine builders. A careful perusal of the following article will show that Canada is maintaining a satisfactory position in the production of large steel castings, such as are required to meet the most exacting conditions both in size and quality.

THE difficulties of making steel castings increase very rapidly after the weight and size pass a certain limit. Extra heavy castings such as are described in this article call for more than ordinary shop equipment, special shipping facilities and very often great ingenuity on the part of the foundry staff.

Castings such as are described in this article are being continually produced at the plant of The Canadian Steel Foundries, Longue Pointe, Montreal. Fig. 1 shows a large cast steel roughing roll of about eight tons and similar to those used in the largest steel mills. Let us follow the different stages of manufacture through which this piece passes beginning at the pattern shop, the various processes encountered in the foundry, until it leaves the finishing lathe and is ready for shipment.

Moulding a Large Roll.

For a more ready understanding of the method of forming the mould it is better to give first a description of the flask.

In this case the latter consists of two halves of a cylinder made of cast steel, two inch wall thickness, reinforced by circumferential flanges and longitudinal ribs of the same dimension. Each half of the flask is built up in short sections bolted together which make them adaptable to the making of long or short rolls as the occasion demands. On one end of each half is bolted a semi-circular steel plate forming the bottom; the metal is poured in at the other end with the flask standing in an upright position. The lower half of flask, known as the drag, consists of a quarter of a circle plus a square, the side of which is equal to the radius of the cylinder. This is done in order to give a bearing to the flask on the floor. In the corner of this square is also placed the riser or aperture through which the metal rises and enables the operator to tell when the mould is filled, it being impossible to detect same through the filling gate.

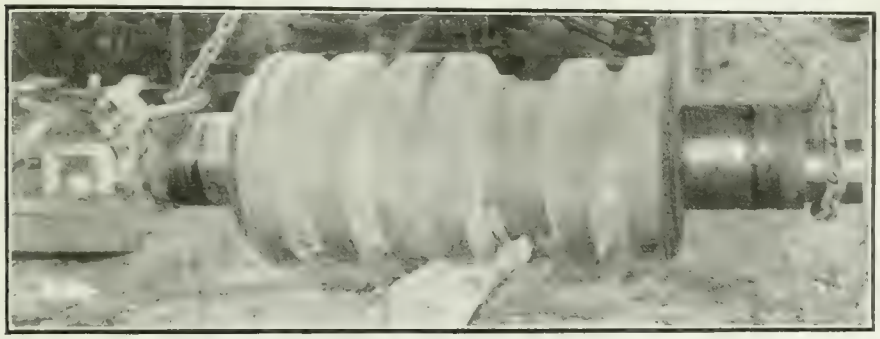


FIG. 1.—CAST STEEL ROLL. WEIGHT 8 TONS.

Specially Prepared Sand.

The next consideration is the sand. It is not to our purpose to enter into an analysis of the sand, so called, which consists of a mixture of special earth, gluten, fire clay, molasses, and other ingredients, furthermore than to say that the object sought after is to obtain a homogeneous and compact mass in the mould. Each foundry has its own practice which amounts almost to a trade secret. The prepared sand is then shovelled into the lower half of the flask and we now come to the most important part of the operation, that is, the forming of the mould proper. For the fashioning of the shape of the roll in the sand no pattern is used; instead a long one inch board, shaped out very much like a ratchet, is employed. There are two hinges on this board, which swings on a horizontal shaft, which has its bearing at either end of the flask. This board, commonly called a sweep, is revolved on its axis in the sand, the teeth on the board forming the ridges on the roll and the spaces between the teeth giving shape to the hollowed out sections on the casting. This method is rapid, and does away with the making of an expensive pattern, which in this case would not only prove unwieldy in handling, but also very liable to breakage. The upper half of the flask or cope, as it is called, is made in the same manner as the drag.

The flask with contained mould is lifted by a crane and carried across to an oven car, on which it is subjected to a surface treatment before it is baked. This treatment consists in painting the mould with a heavy solution of molasses and water. The two halves are then placed in the oven for a thorough baking. The resultant mould must be much harder and more solid than for cast iron. The time taken for the baking process is twelve hours, after which twenty-four hours are allowed for cooling off. The drag and cope are now firmly bolted together and stood on end ready for the pouring of the molten metal. The foundry is equipped with two 30-ton furnaces of the acid open-hearth type. For firing purposes ordinary fuel oil, under a pressure of 80 lbs. per sq. in. and air at 100 lbs. per sq. in. are fed into the furnaces. Five hours are required to melt a charge with a consumption of about 35 gallons of fuel oil per ton of metal. A 40-ton bottom pouring ladle is used, into which the entire charge from the furnace is run.

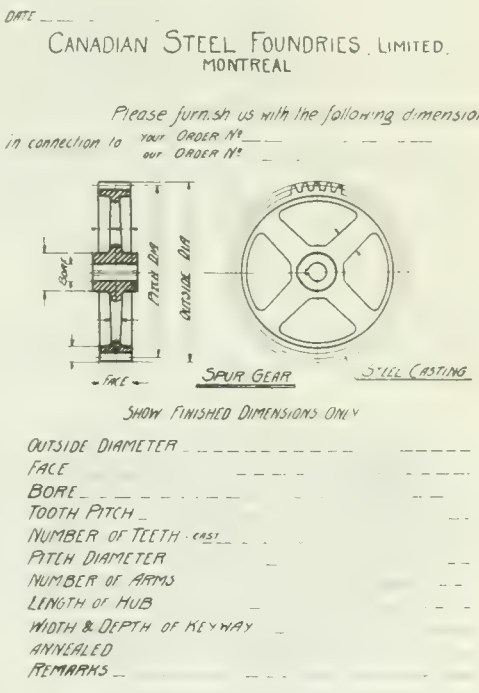


FIG. 2.—PARTICULARS REQUIRED FOR MACHINE MOULDED GEARS.

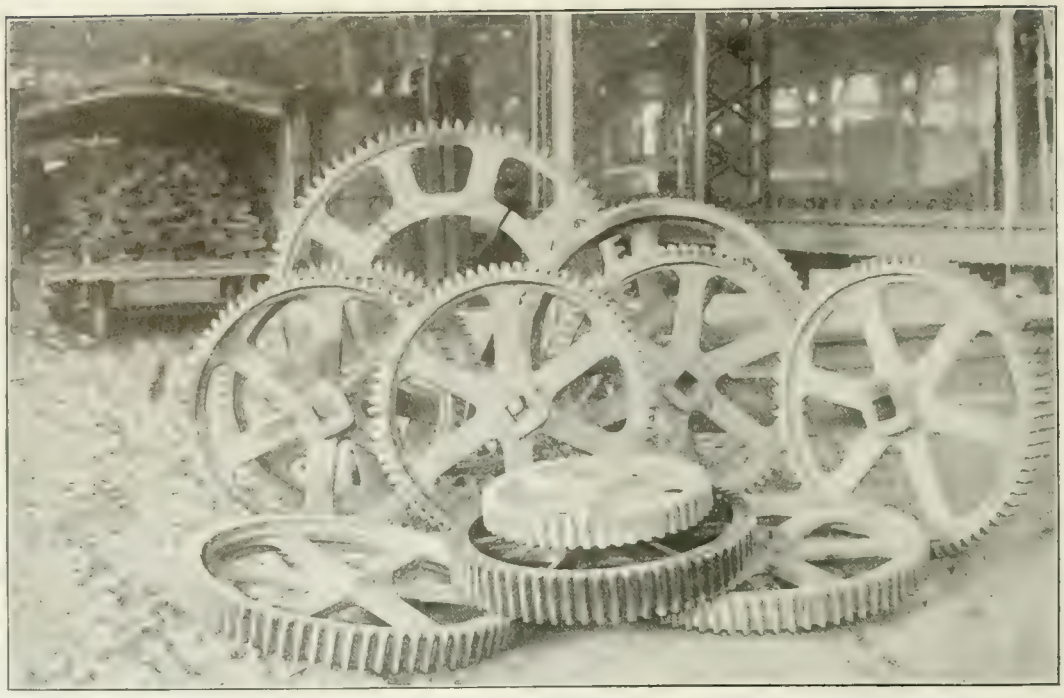


FIG. 3. MACHINE MOULDED GEARS.

Pouring the Metal.

The ladle, of the bottom pouring type, is made from heavy boiler plate lined with fire-brick. A graphite plug of truncated conical shape is used as a stopper for the pouring hole; this plug is connected to a rod which runs through the molten metal, and is insulated from the latter by means of fire-brick discs. The opening and closing is operated by means of a lever attached to the side of the ladle. The life of a graphite plug is considerable, one lasting sometimes for a week. The mould is now poured by one of the foundry cranes carrying the 40-ton bottom pouring ladle, spoken of above, and slowly filled from one end. This operation takes about four minutes. The three or four feet of the roll, which is excess metal, causes a uniform liquid pressure to be exerted full length of the casting and tends to counteract the contraction of the metal while setting. This extra metal is technically known as the crop and runs about 40 per cent. of the total weight of the casting.

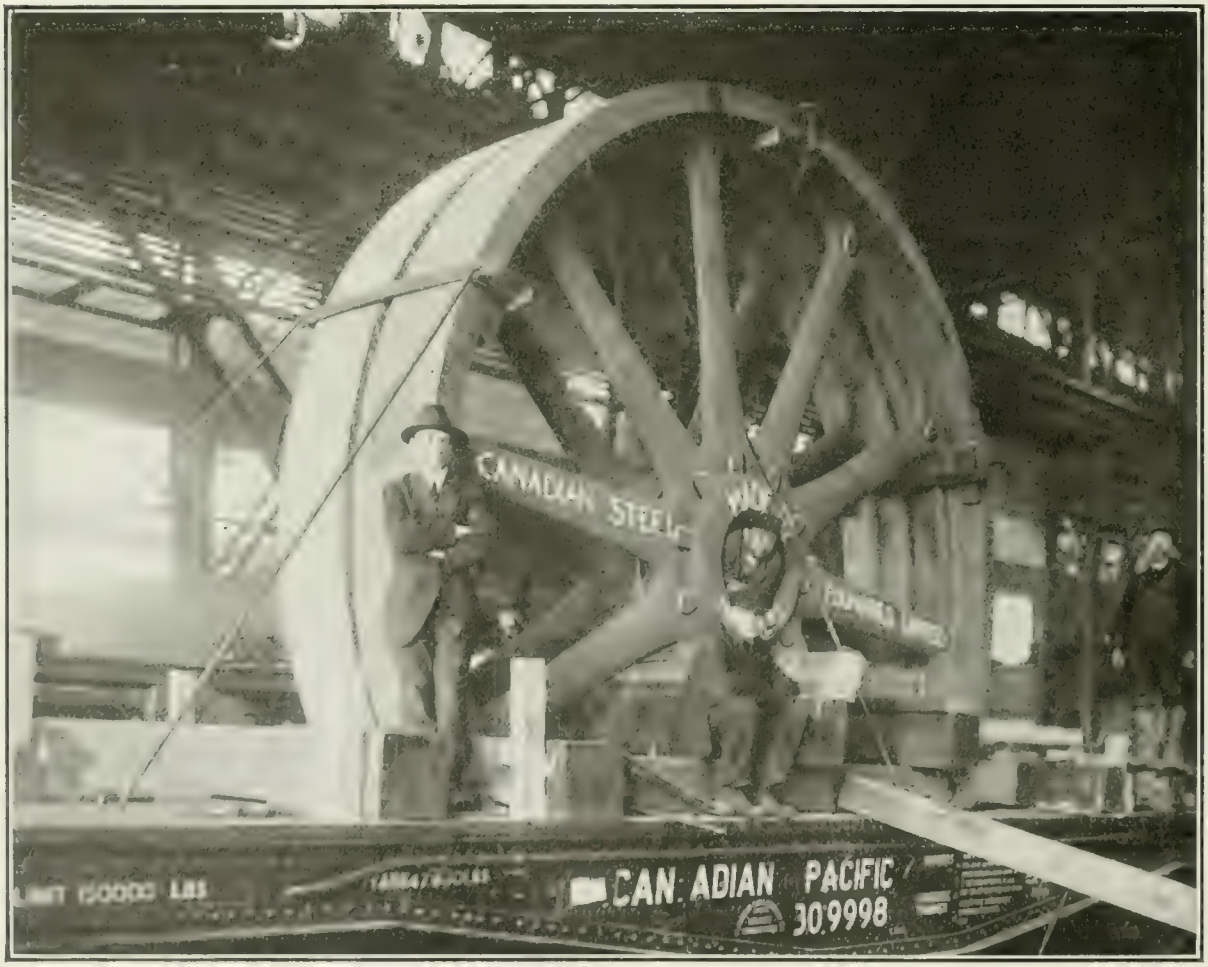


FIG. 5. LARGE STEEL CASTING FOR ELECTRICAL MACHINERY. WEIGHT 19 TONS.

The casting is allowed to remain 24 hours in the mould, after which it is removed to the annealing oven. The latter is a long shallow pit, temporarily arched over with brickwork during heats. The rolls are here subjected to a temperature of 900° F. for about 12 hours. They are then allowed 24 hours in which to cool off. This annealing process produces a uniformly soft casting, at the same

time removing the chill strains set up by unequal rates of cooling. In Fig. 1 it will be noticed that the ends of the roll just outside the bearings are grooved; there are three of these circular slots on each end, their purpose being to engage with three internal teeth of a short sleeve, and act as a flexible coupling or universal joint. The wobbler is moulded only on

steel gears without the necessity of expensive patterns. This is a fact that is not as widely known to the manufacturer as it might be, and one that will often obviate the necessity of a long and tiresome shut-down. The only information required is such as is specified on the form shown in Fig. 2. To such perfection has the machine moulding gear

quired. The tooth-block usually contains two teeth of the same pitch and dimensions as those on the gear to be moulded. Sometimes more than two teeth are used, but as the time is mostly taken up in the ramming and scarcely any in drawing the tooth-block and revolving the machine, it is not of any material advantage to employ more than

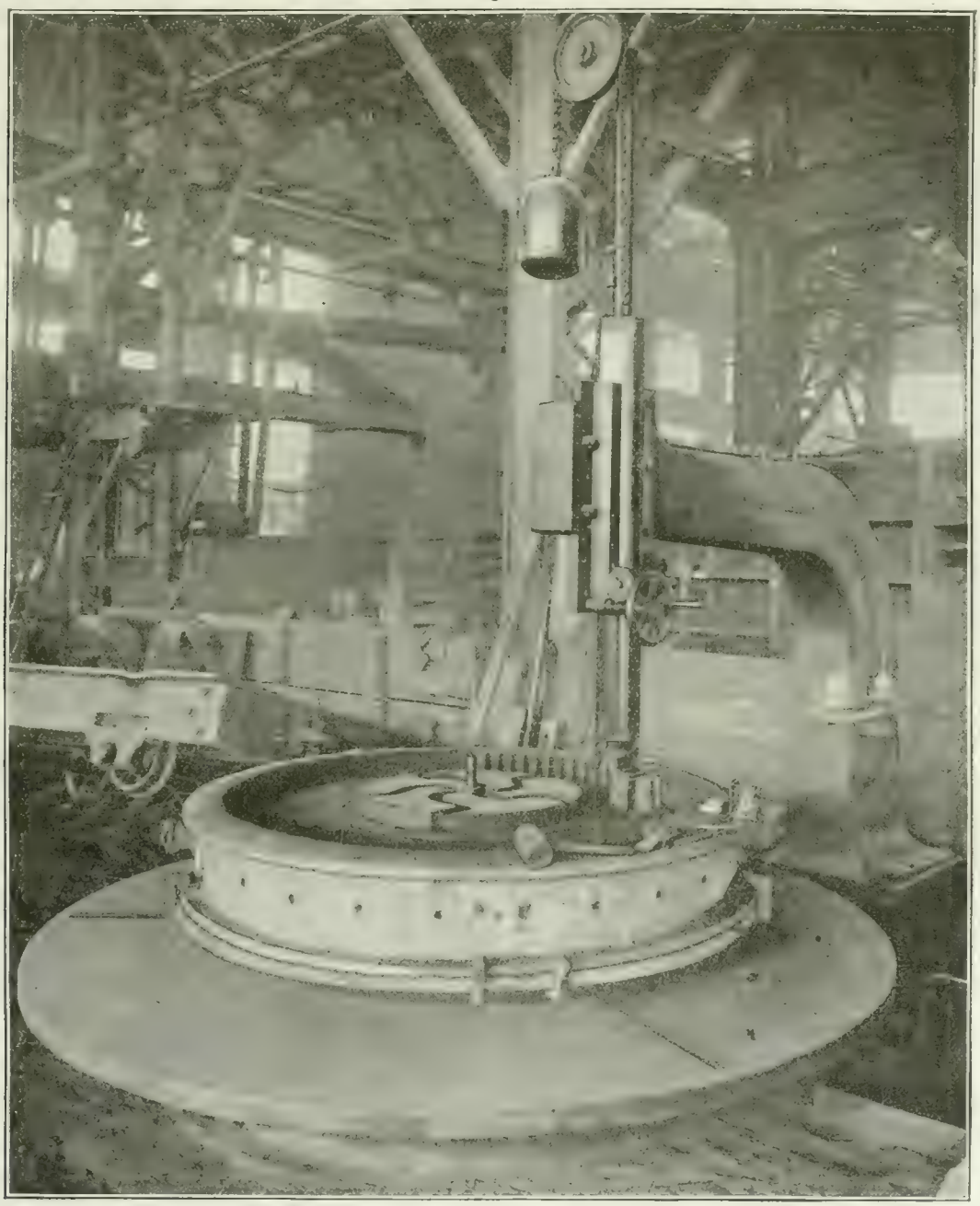


FIG. 4 MOULDING MACHINE PRODUCING MOULD FOR LARGE GEAR WHEEL.

one end, and has to be machined on the other after the riser or crop, spoken of above, has been cut off. The cutting off process is rapidly performed by means of the oxy-acetylene blow torch. The roll is finally turned down to size on a lathe, and is ready for use.

Machine-Moulded Gears.

In the past few years there have been great strides made in the moulding of

machine been brought that very often a gear can be made and shipped before a pattern could be completed.

Fig. 3 shows a few gears made by the machine-moulding process, and Fig. 4 shows the method of moulding. When sufficient care is exercised in making up the tooth block, the gears will be found to be remarkably true and machining will not be re-

two teeth. Moreover, when using a block of two teeth only, a slight alteration in the diameter of the gear can be made, since the "tooth space" only is used, so that the same block can be employed to make a pitch full or bare, which is decidedly convenient in jobbing and repair work. Gears can also be made having one or two teeth, more or less, than the number in the gear for

which the block was originally made. Fig. 5 shows a good example of a large steel spider intended for high speed, heavy duty, electrical equipment, which must necessarily be free from defects of all kinds. An idea of the size of the spider may be gained by comparing the bore (in which one of the men is resting) with the height. It is 16 ft. 6 in. diameter, with a 42-in. face, and weighs 37,930 lbs. There is a clearance of just six inches between the bottom of the spider and the railroad track. Note the clearly-defined bolt bosses and clean outlines of arms and rim. The forming of

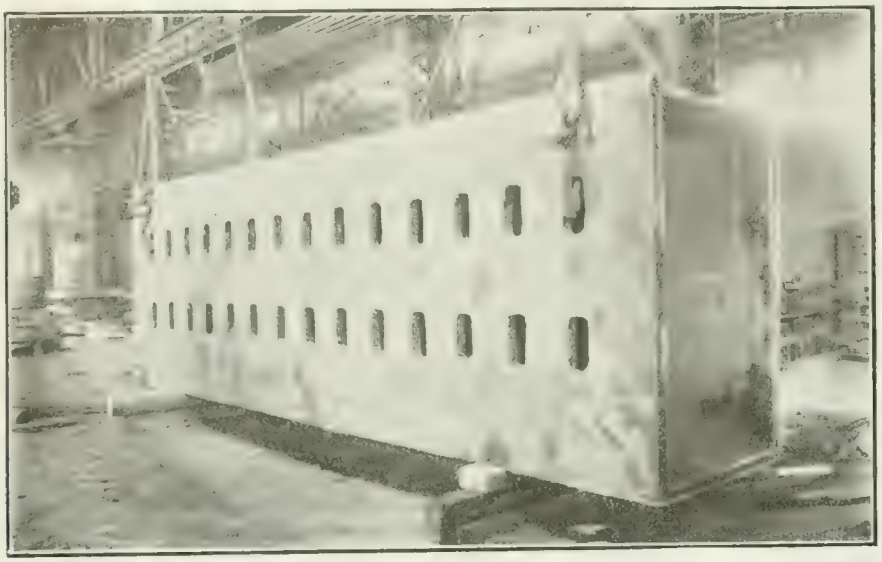


FIG. 6. STEEL CASTING TO FORM PART OF BRIDGE PIER

the mould is somewhat similar to that employed in the case of the roughing roll. In that case a sweep was employed, which revolved in a vertical plane around a horizontal axis, whereas in the case of the spider the sweep is revolved in a horizontal plane around a vertical axis pivoted at the centre or hub. The spaces between the arms are cored out and a riser placed on each arm. The molten metal is poured at the hub. The mould baking and annealing processes are somewhat similar to those employed as described above. Fig. 6 shows an extra heavy steel casting, as used in the piers of the Quebec Bridge. This piece was made from what is known as a skeleton pattern, merely a rough box, the main difficulty being the coring of the holes shown in the photograph.

NOISY GEARS.

THE question of noisy gears being always an acute one amongst automobile and machine tool manufacturers, the writer recently sought to confer a benefit upon humanity by trying to discover the prime cause of the trouble. After some thought it seemed that the most natural way would be to study the question from an acoustic point of view. The fact that a sound was produced by two gears running in mesh was sufficient indication that there was some vibration going on, which was communicated to the ear by the intervening air; to find out how this was produced was the problem.

In the case of a gear box having a number of gears in mesh, the sound could only be characterized as an objectionable noise, but with a single pair of wheels, when they were running sufficiently fast to produce a definite sound, it was an easy matter for even a moderately trained ear to identify it as a single note on the musical scale. In any case, it must be admitted that a noise is but an unpleasant combination of notes.

For the purpose of argument a theory was therefore formed to account for it, and it was assumed that in the interstices between the teeth in mesh small quantities of air were trapped, and that these were hurled out at sufficient frequency to produce an audible musical note, the general action resembling that of the siren. A series of experiments to test this was carried out in the following manner:—

Experimental Test Data.

A gear of 36 teeth 12 pitch was mounted on a mandrel between centres in a lathe, and on the saddle was fixed a bracket which carried a stud on which another gear was mounted. The number of teeth on this gear does not enter into calculation, as will be seen. The lathe was then started, and the gear on the cross slide moved forward to mesh with the gear driven by the lathe. In this particular case the lathe spindle made 484 turns per minute, and it was observed that whilst the pitch of the note did not alter, the volume of sound considerably increased as the gears were moved closer together. The pitch of the note was then recorded by means of an adjustable tuning fork. The gear wheel having 36 teeth and making 484 turns per minute, it is obvious that the number of teeth passing a given point per second would be:

$$\frac{484 \times 36}{60} = 290$$

That is to say, according to the theory, 290 was the frequency of the note. Now 290 is as nearly as possible D on the standard musical scale, so the next step was to strike D on the piano, and, as was expected, the note was exactly in unison with that of the tuning fork.

The experiment was repeated with different gears and speeds, but with the same result; it was always possible to predict the note by calculation. The converse experiment was also performed in which the spindle speed was accurately calculated from the note. This theory would seem to have some corroboration from the quietness of the herring bone gear, probably due to the interference between two series of wave motions whose wave fronts are inclined at an angle to each other.

Even with a theoretically perfect tooth curve, so long as there were any air spaces, there would still be a certain amount of sound, a conclusion that seems somewhat heretical. Of course in an imperfectly cut gear there is a series of actual impacts and scrapes between the teeth as they come in contact which greatly increases the volume of sound.

Whether the theory be right or wrong, one thing is certain, namely, that the pitch of the note is a simple function of the number of teeth passing a given point per second, and that there is a distinct connection between each tooth and each vibration.

The experiments are probably interesting only from an academic point of view, as without a remedy they are valueless, but still, they are offered here as suggesting a comparatively new line of thought.

So far only one practical application has been suggested, and that came from a rabid motorphobe friend of the writer. It was, that all automobile makers should be compelled by law to fit their cars with gears of uniform pitch and ratio, the police being musically trained and armed with tuning forks. Excessive speed could then be easily detected by the preceding method. Herbert's Monthly.

G. R. G. Conway, until recently chief engineer of the British Columbia Electric Railway Co., Vancouver, B. C., will establish an office as consulting engineer at Toronto, Ont.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

NEW CONSTANT SPEED DRIVE PLAIN GRINDING MACHINE.

ANOTHER addition to the already extensive line of single pulley constant speed drive machine tools, built by the Brown & Sharpe Mfg. Co., Providence, R.I., is shown by Figs. 1 and 2, which illustrate their new No. 11 plain grinding machine, which has a capacity for work up to 32 inches length and 6 inches diameter.

The usual advantages of a self-contained drive, such as elimination of complicated overhead works, a wider selection of speeds and feeds, better adaptation to a motor drive, etc., are all to be found in this new design. The method of application is particularly interesting, as it brings out some new ideas in the design of drive for different parts of the machine.

Power is transmitted to the machine through a main driving shaft running in two large taper roller bearings bolted to the rear of the machine. This shaft, running 900 r.p.m., is driven with a 3-in. belt from a simple counter-shaft, containing one tight and loose pulley and one driving pulley to a large pulley located on the end of the main driving shaft, as seen in Figs. 1 and 2. A large pulley located centrally between the two roller bearings on the main driving shaft drives the wheel spindle, with a 3-in. belt running over two idler pulleys. Changes in wheel speeds are obtained by means of split pulleys on the wheel spindle that can be quickly interchanged without removing the belt. The idler pulleys run on taper roller bearings, supported in a heavy swinging bracket so constructed as to follow the transverse movement of the wheel-stand, thus keeping the desired tension upon the driving belt, regardless of the position of the grinding wheel, and insuring accurate feeding of the wheel under all conditions. The slack in the belt, due to the difference in diameter of the wheel spindle pulleys when changes in wheel speeds are made, is taken care of by the top idler pulley, which is provided with separate adjustment, making it possible for the operator to place any desired tension on the wheel spindle driving belt. Referring to Fig. 2, this drive as well as the head-stock and table traverse drive, may be seen.

The table traverse movement is driven by a sprocket A, Fig. 2, located on the speed case, driving sprocket B being located on the table traverse reversing mechanism, which is self-contained in a case fastened into the bed of the machine from the front. The head-stock is driven from the speed case by a sprocket C to a double sprocket D acting as an idler, to a hardened splined sprocket E. A splined shaft supported in bronze bearings under each end of the work-table, sliding in the splined sprocket E, drives, through a chain and sprockets, a telescopic shaft and universal joints, which in turn transmit power to the head-stock chain. The splined and telescopic shafts are clearly shown at the end of the table in Figs. 1 and 2.

The work driving plate is mounted upon a sprocket running on tapered roller bearings around a fixed spindle, which firmly holds a dead centre in such a manner as to become practically an integral part of the head.

All chain drives throughout this machine are of a silent type, eliminating slippage, but providing the desired flexibility and giving a smooth, steady drive to the work. Easy means of adjustment are provided in all cases. The tapered roller bearings used are of an adjustable type, and are lubricated by means of grease cups.

A very important step in the evolution of this machine was taken a short time ago when a simple and efficient speed and feed change mechanism was developed. The mechanism was briefly described in this paper at the time, but it has such an important bearing on the present self-contained drive that an illustration and outline of its principal points are well worth while.

The drive from the main shaft of the machine to the sprockets in the speed case that drive the head-stock and table is of a powerful multiple friction disc type. It enables the operator to easily start and stop the work or table movements without shock, and gives practically universal choice of independent speeds and feeds.

Fig. 3 shows the interior of the speed case, the back having been removed. From the main driving shaft F power is transmitted through gears to two separate driving shafts, G and H, running at a constant speed. These shafts carry

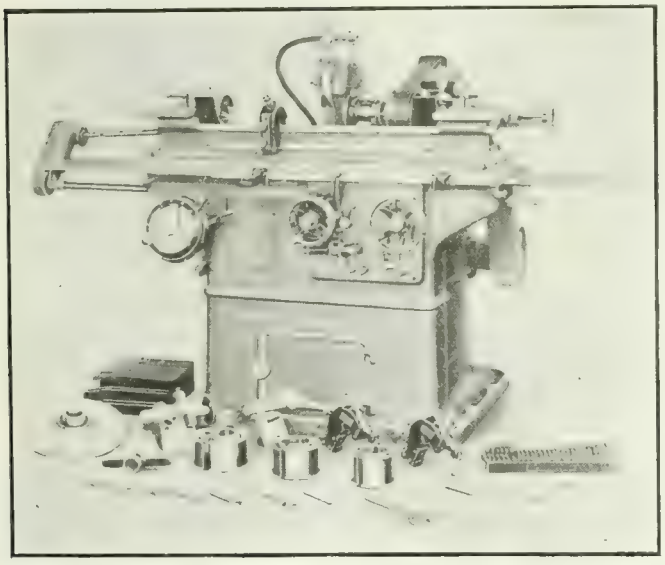


FIG. 1. CONSTANT SPEED DRIVE GRINDING MACHINE.

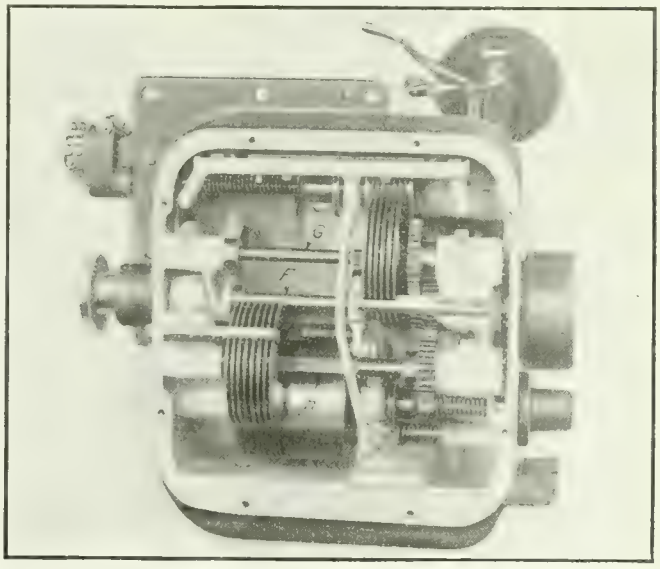


FIG. 3. SPEED CASE FOR CHANGING SPEEDS AND FEEDS.

a series of hardened steel discs, ground slightly convex, and each meshing with another series of hardened steel discs. The latter discs have a rim at their periphery, bringing the point of contact always at their extreme edge. The driving shafts are mounted in swinging brackets pivoted on the main driving shafts bearings. They are swung toward or from the driven shafts, carrying the driving discs toward or from the centre of the driven discs, thus obtaining the desired

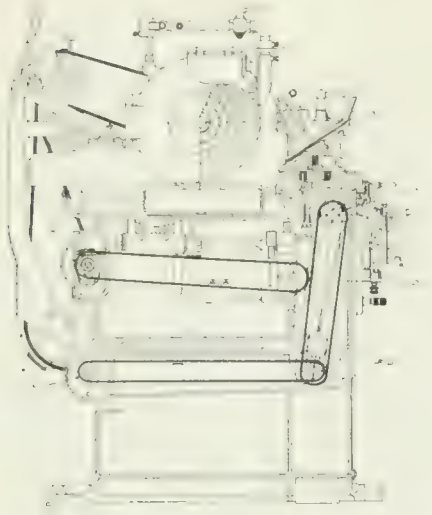


FIG. 2. NEW CONSTANT SPEED DRIVE PLAIN GRINDING MACHINE.

changes in the speed of the work or feed of the table by decreasing or increasing the radius of the driving discs. A continuous flow of oil from a pump direct connected to the main driving shaft furnishes lubricant for the entire case.

The control of the speed case is governed by three levers grouped around a dial mounted at the left of the machine within easy reach of the operator. (See Fig. 1.) The lever marked "Head" controls the head-stock or rotation of the work. Any desired number of revolutions may be obtained, ranging from 82 r.p.m. to 412 r.p.m. A second lever marked "Table" changes the rate of table traverse. The dial is graduated to read in inches per minute. Any desired change from 13 to 181 inches per minute may be obtained. A third and longer lever serves to instantly stop and start both work and table simultaneously without stopping the grinding wheel.

Another new feature found in this machine is the independent automatic cross feed, which enables the wheel to be fed automatically into the work without traversing the table. This feature is especially valuable and efficient when the portion of work to be ground is not as great as the width of the grinding wheel. In feeding the wheel straight in, marked economy in production may be secured. This independent automatic cross feed is driven from the table traverse mechanism, and operates the ratchet arrangement of the regular automatic cross feed. As a result, the full number of changes of feed that can be made with the regular cross-feed mechanism are available. These may be increased or decreased by changing the speed of the table traverse mechanism with the table traverse feed change mechanism, giving practically a universal selection of feeds from the coarsest to finest that are ever required. A positive safety lock is provided to prevent throwing in the table traverse when the independent automatic cross feed is in operation.

These important features in design in connection with the general heavy, compact and rigid construction, the handy arrangement of operating levers, hand wheels, etc., fit this new machine particularly for the requirements of manufacturers on dead centre work, either straight or taper, within its capacity.

DUPLEX SPIKE SLOT HYDRAULIC PUNCH.

THE Watson-Stillman Co., Aldene, N.J., has brought out a new hydraulic punch for cutting out two spike slots in railroad or conductor rails at one setting. The advantages claimed for this tool are that two holes can be punched at one operation on opposite sides of the rail in exact alignment, thereby saving the time usually consumed in laying out centres and changing the machine from one side to the other of the rail. The action of the punch is as follows:—

By referring to the illustration it will be noted that one punch is attached to a chain. This punch being removed, the tool is placed against the rail and the loose punch inserted in place. The punches are then run down to the rail by pinions, meshing into racks on the rams, and a few strokes of the pump lever completes the operation. The whole action, we understand, takes less than two minutes, and involves little effort.

The punch is compactly built, and is so designed that the greatest strength is obtained with the least possible weight. The working parts are readily accessible for cleaning, and the punches and dies are removable for sharpening, renewal, etc.

TRADE RETURNS WITH GREAT BRITAIN.

THE following are the official figures of trade between Canada and Great Britain in the undermentioned articles during June:

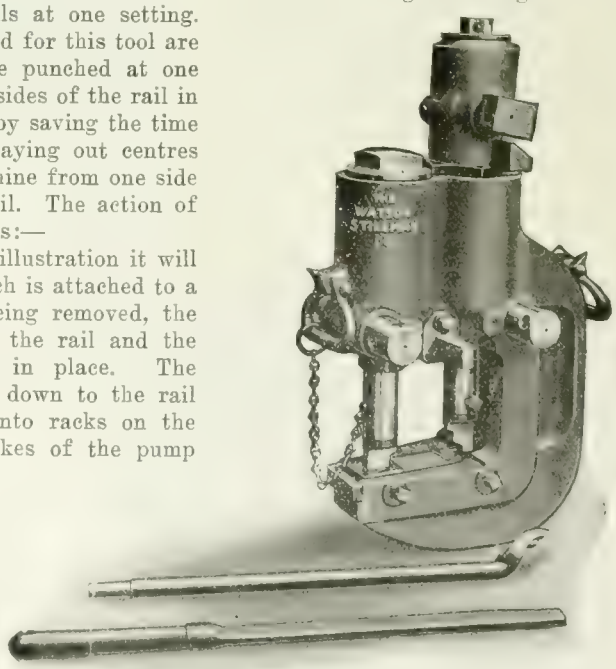
Exports From Canada.

	June, 1915.	June, 1914
Wheat	£1,340,475	£1,116,692
Wheatmeal and flour	338,884	168,701
Barley	.....	130,669
Oats	24,675	128,462
Bacon	291,480	100,421
Hams	44,467	31,219
Cheese	466,121	262,200
Canned salmon	109.372	6,810
Canned lobsters	19,006	39,242

Imports to Canada.

Spirits	£ 30,882	£ 53,040
Wool	3,984	3,152
Pig iron	1,791	6,109
Wrought rails	....	1,102
Galv. sheets	21,593	27,629
Tinned plates	5,513	5,227
Steel bars	4,909	13,481
Pig lead	1,024	3,164
Cutlery	5,574	8,252
Hardware	2,394	8,588

The Leon Torpedo—The form of drifting mine used by the Turks is believed to be the Leon torpedo, which resembles a short Whitehead torpedo. It can be discharged through a torpedo tube or dropped overboard. It is not an automobile torpedo, but a freely-floating mine, which can be set to oscillate between any depths below the surface. The torpedo sinks until automatically the propeller is brought into use and drives it upwards again, when the action of the propeller ceases. There is a time arrangement embodied by which the duration of its floating can be regulated.



DUPLEX SPIKE SLOT HYDRAULIC PUNCH.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - General Manager
H. V. TYRRELL - - - - - Asst. General Manager

PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors.
A. G. WEBSTER, J. M. WILSON, J. H. RODGERS,

B. G. NEWTON - - - - - Advertising Manager

OFFICES:

CANADA—
Montreal—Rooms 701-702 Eastern Townships Bank Building. Telephone Main 1255.
Toronto—143-153 University Ave. Telephone Main 7324.
Winnipeg—34 Royal Bank Building. Telephone Garry 2313.

UNITED STATES—
New York—R. B. Huestis, 115 Broadway. Phone 8971 Rector.
Chicago—A. H. Byrne, Room 607, 140 South Dearborn St. Telephone Randolph 3234.
Boston—C. L. Morton, Room 733, Old South Bldg. Telephone Main 1024.

GREAT BRITAIN—
London—The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C. E. J. Dodd, Director. Telephone Central 12960. Address: Atabek, London, England.

SUBSCRIPTION RATES:

Canada, $2.00; United States, $2.50; Great Britain, Australia and other Colonies, 8s. 6d. per year; other countries, $3.00. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. XIV. JULY 29, 1915 No. 5

PRINCIPAL CONTENTS.

Machining 4.5 H.E. Shells in a Steel Foundry Plant.....113-121

General 121
New Factory Inspection Regulations....Post Bellum Competition.

The Design and Constructional Features of Plug Gauges, I. 122-123

Refinements in Mechanical Drawing 124

The Successful Production of Large Steel Castings 125-128

General 128
Noisy Gears.

Progress in New Equipment 129-130
New Constant Speed Drive Plain Grinding Machine.... Duplex Spike Slot Hydraulic Punch.

General 130

Editorial 131
The "Returns" Value of Advertising.

Selected Market Quotations 132-133

The General Market Conditions and Tendencies 133-136
Toronto Letter....Equipment for Australian Railways ....Newfoundland Trade....By Sea From B.C. to Hudson's Bay....Windsor a Northern Navigation Co. Terminal....Ontario's Nickel Commission....Canadian Government Purchasing Commission....Allies' Purchasing Agents .... Prince Rupert Dry Dock .... Zinc Situation in Canada....Trade Gossip....Canadian Commercial Intelligence Service.

Industrial and Construction News (Advtg. Section)..... 64-74

THE "RETURNS" VALUE OF ADVERTISING.

IN the determination to take advertising space in a publication—domestic, trade or technical, what, we ask, are the considerations on which the decision usually depends? At first sight the query would not only seem to be unnecessary, but bear evidence as well of apparent lack of knowledge of human nature. Without, therefore, giving the slightest thought to the matter, a great majority of those appealed to would unhesitatingly reply that at the very least direct results equivalent to the money spent would be desired and ultimately expected.

There is little of sentiment, it would appear, in advertising, as a consequence there is generally little disposition on the part of the advertiser to either realize that he may or should be a benefactor even to a small extent. The general tendency is, as we have already said, towards direct and sufficient-in-value returns. Scant consideration, if any, is extended to what are known as indirect results, the smack of philanthrophy about these being considered altogether "unhealthy" from a business standpoint.

In spite, however, of the views so generally and tenaciously held, and the persistency with which we endeavor to put them into practice, isn't it true that in spite of what we achieve or otherwise in direct results from our advertising, we actually achieve more in the indirect sense, and become in very fact benefactors—even philanthropists in spite of ourselves

Most manufacturing concerns advertise because it pays them to do so; some don't, because they believe they can do equally well without advertising; others again may or may not advertise because of the fact that their particular product belongs to one of a few selective industries in which, although competition may be and is more or less keen, no possible monetary return is realizable.

Concerning the latter classification and specifically those who advertise—quite a few do so, the action taken may be meant to indicate simply a desire to keep the firm name before the public, a by-no-means unwise proceeding. There is, however, much more involved in such advertising than simply keeping one's name before the public, and just here it seems, that, were nothing else considered, some sensible percentage of every advertising appropriation should be excluded from direct results expectations and be ear-marked "the public eye only."

Advertising of any sort has an educative value, the latter being unrestricted to the mere bringing of buyer and seller together. It has made possible the placing in the hands of the public, at little cost, literature which aids them in every conceivable condition, circumstance and difficulty, and in no sphere is this so fully exemplified as in the arts, crafts and manufactures. Publications relative to each of these are recognized necessities, as only through their medium are the administrative and operative staffs of any particular industry kept in prompt, intimate touch with developments which may affect its welfare either way.

Through the opportunity of becoming a subscriber to a trade or technical journal the operative mechanic adds to his capabilities, and as a result enhances his earning capacity relative to his employer as well as to himself. Under such circumstances then, should not a further and quite husky percentage of every advertising appropriation be excised from the direct returns expectation column of the ledger and be esteemed as indirectly reflected in the increased efficiency and output of the shop. It seems to us that even the most progressive of our manufacturers realize in but small degree, if at all, that advertising appropriations are a most potent factor in the education and training of their employees.

Advertising, in that it places within easy reach of operatives of every class and grade a reputable trade or technical journal periodically and regularly, warrants expression of our conviction that whether systematically, intermittently or never practised, there is need for a complete change of viewpoint. The general attitude relative to it is that of an expenditure chargeable to profit and loss account, whereas, when properly considered and allocated, its service rendered belongs more truly to an expenditure on capital account, and is therefore an asset subject to a regular depreciation percentage only.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey Forge, Pittsburgh	$13 20	$13 45
Lake Superior, charcoal, Chicago	.....	15 75
Ferro Nickel pig iron (Soo)	.....	25 00

	Montreal.	Toronto.
Middlesboro, No. 3	21 00	.....
Carron, special	22 00	.....
Carron, soft	22 00	.....
Cleveland, No. 3	21 00	.....
Clarence, No. 3	21 00	.....
Glengarnock	25 00	.....
Summerlee, No. 1	25 00	.....
Summerlee, No. 3	25 00	.....
Michigan charcoal iron.	25 00	.....
Victoria, No. 1	21 00	19 00
Victoria, No. 2X	21 00	19 00
Victoria, No. 2 Plain	21 00	19 00
Hamilton, No. 1	20 00	19 00
Hamilton, No. 2	20 00	19 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2.20
Steel bars, f.o.b., Toronto	2.20
Common bar iron, f.o.b., Montreal	2.20
Steel bars, f.o.b., Montreal	2.20
Bessemer rails, heavy, at mill	1,25
Steel bars, Pittsburgh	1.25
Twisted reinforcing bars	2.15
Tank plates, Pittsburgh	1.25
Beams and angles, Pittsburgh	1.25
Steel hoops, Pittsburgh	1.30

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.10
Small shapes	2.35

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	1.65
Structural shapes	1.75
Plates	1.75

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal.	Toronto.
Plates, ¼ to ½ in., 100 lb.	$2 35	$2 25
Heads, per 100 lb.	2 55	2 45
Tank plates, 3-16 in.	2 60	2 45

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$12 50	$12 50
Copper, crucible	14 50	14 50
Copper, unch-bled, heavy	14 00	14 00
Copper, wire, unch-bled.	14 00	14 00
No. 1 machine, compos'n	11 50	12 50
No. 1 compos'n turnings	10 50	9 25
No. 1 wrought iron	6 00	6 00
Heavy melting steel	5 75	6 00
No. 1 machin'y cast iron	10 50	10 50
New brass clippings	12 00	12 00
No. 1 brass turnings	10 00	10 00
Heavy lead	4 50	5 00
Tea lead	$ 3 50	$ 3 75
Scrap zinc	12 00	14 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect June 25, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	63	32½	....	....
½ in	68	41½	....	....
¾ to 1½ in.	73	46½	....	....
2 in.	73	46½	69	42½
2½ to 4 in.	73	46½	72	45½
4½, 5, 6 in.	....	....	70	43½
7, 8, 10 in.	....	....	67	40½
X Strong P. E.				
¼, ⅜ in.	56	32½	....	....
½ in.	63	39½	....	....
¾ to 1½ in.	67	43½	....	....
2, 2½, 3 in.	68	44½	....	....
2 in.	....	....	63	39½
2½ to 4 in.	....	....	63	42½
4½, 5, 6 in.	....	....	66	42½
7, 8 in.	....	....	59	35½
XX Strong P. E.				
½ to 2 in.	44	20½	....	....
2½ to 6 in.	....	....	43	19½
7 to 8 in.	....	....	40	16½
Genuine Wrot Iron.				
⅜ in.	57	26½	....	....
½ in.	62	35½	....	....
¾ to 1½ in.	67	40½	....	....
2 in.	67	40½	63	36½
2½, 3 in.	67	40½	66	39½
3½, 4 in.	....	....	66	39½
4½, 5, 6 in.	....	....	63	36½
7, 8 in.	....	....	60	33½

Wrought Nipples.	
4 in. and under	77½%
4½ in. and larger	72½%
4 in. and under, running thread.	57½%
Standard Couplings.	
4 in. and under	60%
4½ in. and larger	40%

MILLED PRODUCTS.

Sq. & Hex. Head Cap Screws	65%
Sq. Head Set Screws	65 & 10%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in. N.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto
Lake copper, carload	$21 00	$21 00
Electrolytic copper	20 75	20 75
Castings, copper	20 50	20 50
Tin	41 00	41 00
Spelter	25 00	25 00
Lead	7 50	7 25
Antimony	40 00	40 00
Aluminum	40 00	40 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer, billets, Pittsburgh	$22 00
Openhearth billets, Pittsburgh	22 00
Forging billets, Pittsburgh	28 00
Wire rods, Pittsburgh	25 50

NAILS AND SPIKES.

Standard steel wire nails, base	$2 40	$2 35
Cut nails	2 50	2 70
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	2 85	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	75
Stove bolts	80
Plate washers	40
Machine bolts, ⅜ and less	70
Machine bolts, 7-16 and over	60
Blank bolts	60
Bolt ends	60
Machine screws, iron, brass	35 p.c.
Nuts, square, all sizes	4¼c per lb. off
Nuts, Hexagon, all sizes	4¾c per lb. off
Iron rivets	72½ per cent.
Boiler rivets, base, ¾-in. and larger	$3.25
Structural rivets, as above	3.25
Wood screws, flathead, bright	85, 10, 7½, 10 p.c. off
Wood screws, flathead, Brass	75 p.c. off
Wood screws, flathead, Bronze	70 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong, Sizes Ins.	Price per ft.	D. Ex. Strong, Size Ins.	Price per ft.
⅛in	$ .05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	.....
7 in	2.38	7 in	3.81	....	.....
8 in	2.50	8 in	4.34	....	.....
8 in	2.88	9 in	4.90	....	.....
9 in	3.45	10 in	5.48	....	.....
10 in	3.20	....	....	....	.....
10 in	3.50	....	....	....	.....
10 in	4.12	....	....	....	.....

COKE AND COAL.

Solvay Foundry Coke	$5.75
Connellsville Foundry Coke	4.85-5.15
Yough, Steam Lump Coal	3.83
Penn. Steam Lump Coal	3.63
Best Slack	2.99

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	40%
At warehouse	40%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS.

Solder, half-and-half	.26¾
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.67
Glue, French medal, per lb.	0.18
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.18
Benzine, single bbls., per gal.	0.18
Pure turpentine, single bbls.	0.66
Linseed oil, raw, single bbls.	0.73
Linseed oil, boiled, single bbls.	0.76
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.00
Lead wool, per lb.	0.10
Pure Manila rope	0.16
Transmission rope, Manila	0.19½
Drilling cables, Manila	0.17½
Lard oil, per gal.	0.60

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ inch	$8.00
5-16 inch	5.35
⅜ inch	4.60
7-16 inch	4.30
½ inch	4.05
9-16 inch	4.05
⅝ inch	3.90
¾ inch	3.85
⅞ inch	3.65
1 inch	3.45

Above quotations are per 100 lbs.

TWIST DRILLS.

	%
Carbon up to 1½ in.	60
Carbon over 1½ in.	25
High Speed	40
Blacksmith	60
Bit Stock	60 and 5
Centre Drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS.

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, 35 per cent.; cast iron, 60; standard bushings, 60; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 75; malleable, lipped unions, 65.

TAPES.

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 00	$2 90
Canada plates, dull, 52 sheets	3 25	3 50
Canada Plates, all bright6	4 40	4 60
Apollo brand, 10¾ oz. galvanized)	6 40	5 95
Queen's Head, 28 B.W.G.	6 50	6 50
Lleur-de-Lis, 28 B.W.G.	5 75	5 75
Gorbal's Best, No. 28	6 50	6 50
Viking metal, No. 28	6 00	6 00
Colborne Crown, No. 28	5 38	5 30

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$10 00	.....
1¼ in.	10 00	.....
1½ in.	10 00	.....
1¾ in.	10 00	.....
2 in.	10 50	9 20
2¼ in.	12 10	.....
2½ in.	13 05	12 10
3 in.	15 75	12 70
3¼ in.	.....	13 90
3½ in.	20 00	15 00
4 in.	25 50	18 90

Prices per 100 feet, Montreal and Toronto.

BELTING—NO. 1 OAK TANNED.

Extra heavy, sgle. and dble.	50%
Standard	50 & 10%
Cut leather lacing, No. 1	$1.20
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$9.00
¼ in.	6.25
5-16 in.	4.65
⅜ in.	4.00
7-16 in.	4.00
½ in.	4.00

Prices per 100 lbs.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 10¼
X Grand	0 09¾
XLCR	0 09¼
X Empire	0 08½
X Press	0 07¾
COLORED.	
Lion	0 07⅛
Standard	0 06⅜
Popular	0 05¾
Keen	0 05¼
WOOL PACKING.	
Arrow	0 16
Axle	0 11
Anvil	0 08
Anchor	0 07
WASHED WIPERS.	
Select White	0 09
Mixed Colored	0 06¼
Dark Colored	0 05¼

This list subject to trade discount for quantity.

BELTING RUBBER.

Standard	50%
Best grades	30%

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Toronto, Ont., July 27, 1915.—There are no developments of any particular importance to note this week. Factories working on war orders continue busy and the hope is freely expressed that more orders for war equipment will be placed in Canada. David A. Thomas, the representative of the Imperial Government, has arrived in Ottawa to confer with the Shell Committee. He will also investigate the capacity of Canadian plants to produce munitions, but not place any orders, this matter being in the hands of the Shell Committee. It is understood that he will visit Toronto and Montreal in due course. The situation in regard to the shell industry is unchanged, but developments may be looked for in a month or six weeks. Those firms, however, who contemplate going into the shell business, are ordering the necessary tools and equipment so as to be ready when new orders are distributed.

Considering the extraordinary conditions prevailing owing to the war, there are many reasons to be satisfied with the present outlook from a purely business standpoint. The crop reports are distinctly encouraging, a gratifying feature at any time, but especially so during such times as these.

The country has benefited considerably by the large amount of money that has been distributed in payment for war

orders. Further, the trade returns for June are decidedly encouraging as they show a large increase in exports and a decline in imports and therefore a more favorable trade balance. There is no reason why this should not continue, in fact there are indications that such will be the case.

Steel Market.

The general situation in the steel trade is much the same as has prevailed during the past few weeks. The heavy demand for steel bars and forgings for shells continues and indications point to a continuance of this condition for some time to come. War orders for other steel products amount to fair tonage in the aggregate, but in ordinary lines there is little of interest to note. There is, however, a fairly optimistic tone in the market based on the hope that foreign business will develop to the ultimate benefit of the steel trade. Merchant business continues quiet and the building trade is not showing any pronounced activity.

There is little change to note in the galvanized sheet situation. There is a tendency to shade prices but some makers are still out of the market on account of the spelter situation. Prices of No. 28 black sheets are firmer, but the demand is light.

Conditions in the steel trade in the States continue to improve, principally on account of export business which continues to expand. The Steel Corporation are operating at about 91 per cent. of the ingot capacity and other concerns are showing a similar activity. Quotations on Bessemer and open hearth steel billets have advanced respectively to $22 and $23 per ton, Pittsburg, while prices of bars, plates and shapes are firm, with a higher tendency.

Pig Iron.

There is little of importance to note in this market. Foundries generally are very quiet and operating at considerably reduced capacity. Quotations are unchanged.

Scrap Metal.

The demand for heavy melting steel is improving and quotations are firmer. Copper and brass scrap continue in good demand and prices are holding firm. Wrought iron and cast iron scrap are quiet. Prices are given in the selected market quotations.

Machine Tools.

Prospective shell manufacturers are sending out inquiries for equipment which are keeping local dealers busy. Makers of machine tools are filled up with orders and deliveries are getting worse rather than better. There is nothing particularly new in the situation but developments may be expected when further orders for shells come to be distributed.

Supplies.

Business continues brisk in machine shop supplies and quotations are holding firm. The long expected advance in leathere belting has materialized, the new discounts being as follows: Extra Heavy 50%, and Standard 50 and 10%. Tool steel has already advanced and the situation is serious owing to the scarcity of tungsten. For the same reason an advance in prices of twist drills is expected, there being at the same time a heavy demand. Solder "Half and Half," is weaker and is now quoted at 26¾c per pound. The linseed oil market is unsettled with a variation in prices, but the figure given in the selected market quotations may be taken as a fair average. Lead wool has advanced 1c and is now quoted at 10c per pound.

EQUIPMENT FOR AUSTRALIAN RAILWAYS.

Tender forms, specifications and drawing have been forwarded by D. H. Ross, Trade Commissioner at Melbourne, for equipment required by the Victorian Government railways. These tender forms are open to the inspection of Canadian manufacturers when received at the Department of Trade and Commerce, Ottawa (refer File No. 1435). Particulars of the requirements, together with the date on which the tenders close at Melbourne, are briefly outlined thus:—

29031 — Sept. 15, 1915 — 81 (bogie) cast steel wheel centres.

29031 — Sept. 15, 1915 — 81 (leading and trailing) cast steel wheel centres.

29031 — Sept. 15, 1915 — 41 (driving) cast steel wheel centres.

29031—Sept. 15, 1915—10,000 (van and truck) cast steel wheel centres as per drawings.

The departure of the mails from San Francisco and Vancouver are as follows:—From San Francisco August 18, due Melbourne September 15.

Metals.

General weakness prevails in the metal market this week, antimony being the only metal showing any strength. Tin, copper and spelter have all declined, due to a light demand, while the lead market is stagnant for the same reason. Considering the heavy consumption of copper at the present time, the weakness in the market is rather surprising, but as soon as confidence is restored the market should recover. Solders are all lower on account of the decline in tin. The situation in regard to aluminum is unchanged, supplies are scarce and quotations are nominal. Business locally continues good, the demand for metals for munitions forming the greater proportion of this.

Tin—The tin market continues to decline on account of light demand, this encouraging uncovered buyers to keep out of the market except for absolute requirements. The recent small demand is chiefly caused by the majority of buyers receiving tin on old contracts. Tin has declined 1c locally and is quoted at 44c per pound.

Copper—The market is weak with no improvement in demand. The weakness is perhaps due to the high prices having caused the production to increase to a larger degree than the demand. It is also suggested that the restriction in buying is due to the fact that several concerns who accepted large war orders have not got their plants in operation as soon as was expected. The copper situation is, however, strong, owing to very heavy consumption and the market cannot help but recover. Copper has declined ½c and is quoted at 21c per pound.

Spelter—The situation continues much the same, but the market is weak and lower. The demand has fallen off and some of the producers who had been holding for higher prices appear to be now willing to accept less. The scarcity, however, continues and with a better demand the market would no doubt recover. Local quotations have declined 3c and are nominal at 25c per pound.

Lead—The market is stagnant with a weak undertone. There is a falling off in demand and lead is being offered at a figure below the "Trust" price. Local quotations are unchanged at 7¼c per pound.

Antimony—Although antimony is dull there is a very firm tone in the market. Consumption of the metal is almost entirely limited now to the provision of war requirements which are more likely to increase than diminish. Quotations are unchanged and nominal at 40c per pound.

Aluminum—The market is strong and the situation unchanged. Supplies continue scarce and quotations nominal at 40c per pound.

NEWFOUNDLAND TRADE.

THE transfer to the United States and Canada of a large amount of the trade ordinarily carried on between Newfoundland and Great Britain is one of the results of the war. This arises from the changes in the shipping situation.

The gradual withdrawal of trans-Atlantic steamers from the port of St.

John's because of the transport needs of the British Admiralty and the requirements of British trade has reached a point where only three small steamers are now plying between St. John's and Liverpool. These are freight vessels of the Furness Line, with practically no passenger accommodation.

The latest reduction in the service is the taking off of the Allan Line steamers, which for nearly fifty years have plied between Glasgow, St. John's, Halifax and Philadelphia. These ships, the Mongolian, Carthaginian, Pomeranian and Sardinian, are to be transfered to the route between Montreal and British ports.

Business men have necessarily made new connections in Canada and the United States, and steamers making weekly trips between St. John's, Halifax and New York are laden to the hatches.

BY SEA FROM B.C. TO HUDSON'S BAY.

A NEW chapter in Canadian history has been opened in the successful shipping of a cargo of Douglas fir from British Columbia to Hudson Bay, via the Panama Canal. The timber, which is to be used in the construction of piers and docks at Port Nelson, was sold to the Department of Railways and Canals by Hugh A. Rose, representative of the Canadian Western Lumber Co. A further consignment of lumber is on the way to the Polson Ironworks, Toronto, to be made into masts for a dredge which is being built for use at Port Nelson. Hitherto the lumber used at Hudson Bay has been southern pine from the United States. The cargo was carried by the Government steamer Durley Chine, which was the first boat to carry Douglas fir from one Canadian port to another.

WINDSOR A NOR. NAV. CO. TERMINAL.

THE importance of Windsor, Ont., as a lake port was made further evident on July 22 by the announcement of H. H. Gildersleeve, General Manager of the Northern Navigation Company, that, beginning immediately Windsor and Detroit would become the southern terminal for the company's steamers Noronic, Huronic and Hamonic, which make weekly trips to the Soo, Port Arthur, Fort William and Duluth.

The change of the southern terminal from Sarnia to Detroit and Windsor was brought about by the activities of the Windsor Board of Trade. General Manager Gildersleeve was reached in Montreal where he had gone to make arrangeemnts with Grand Trunk Railroad officials for the use of the Brush street wharf in Detroit. He said the company's steamers would start from Detroit, and after crossing to Windsor would start on their voyages to the north.

ONTARIO'S NICKEL COMMISSION.

FOLLOWING a prolonged controversy arising out of certain charges that nickel from Ontario mines was finding its way through various channels to Germany since the outbreak of hostilities in Europe, the Provincial Government a few days ago, through the Hon. Howard Ferguson, Minister of Forests and Mines, announced the appointment of the following Commission:

George T. Holloway, London, Eng., Chairman.

Willet G. Miller, Provincial Geologist, Toronto.

McGregor Young, K.C., Toronto.

Thomas W. Gibson, Deputy Minister of Mines, Toronto, Secretary.

The Commission is empowered to inquire into the whole nickel situation in Ontario with a view to establishing in the Province an industry that will have the material under observation from the time it leaves the mines to the time it is marketed.

While assurances have been given to the Imperial authorities and the Dominion and Provincial Governments that not an ounce of Ontario's nickel is finding its way into the enemy's hands, Hon. Mr. Ferguson states that the Provincial Government views the situation from a larger standpoint and has instructed the new Commission to ascertain whether it is not possible to complete the refining of nickel ore from the mines of Ontario entirely within the Province without having to ship it to American refineries.

The question of the province receiving an adequate return from its nickel deposits is regarded as of much importance, and on this point the Commission will also advise the Government.

CANADIAN GOVERNMENT PURCHASING COMMISSION.

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George Gault, Winnipeg; Henry Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

ALLIES PURCHASING AGENTS.

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:—

International Purchasing Commission, India House, Kingsway, London, Eng.

British.—Col. A. G. Barton and F. W. Stobart, Ritz Carlton Hotel, Montreal.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendance Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminister, London.

Russian.—Messrs. S. Ruperti and Aieksieff, care Military Attache, Russian Embassy, Washington, D.C.

PRINCE RUPERT DRY DOCK.

THE big dry dock at Prince Rupert, constructed by the Grand Trunk Pacific Railway in conjunction with the Dominion Government, is expected to be ready for service by August 1st. The dock, which has cost $2,500,000, consists of three units, with a total capacity of 20,000 tons. There will be two end sections of 5,000 tons each, and a middle section capable of accommodating a 10,000-ton vessel. All the units are interchangeable, and each dock is complete in itself, with pumps and air compressors. By employing the three sections together a 600-ft. steamer can be dealt with.

In addition to the actual dock there are five other features of the plant, namely, the foundry, which will be able to make castings as heavy as 12 tons; a boiler shop for marine repairs as well as for the construction of boilers; a machine shop; a ship shed and carpenters' shop; and a power-house equipped with two large turbo-generators and a 1,500 cu. ft. per min. air compressor. Construction work in connection with the dry dock and its accompanying plant has been under way since the beginning of 1912.

ZINC SITUATION IN CANADA.

THAT there is a scarcity of zinc in Canada is evidenced by the price to which it has advanced, from six cents a pound at the outbreak of the war to from 22 to 25 cents a pound to-day. Copper, the other metal which forms one of the elements of brass, has advanced from only 15 cents a pound to 20 cents a pound. Yellow brass, although better for shell purposes, is not as high-grade as the red brass, and yet, owing to the advanced price of zinc, it is now dearer. Yellow brass contains about 60 per cent. copper and 40 per cent. zinc, with a trifle of lead, and the red brass about 80 to 90

per cent. copper and 10 to 20 per cent. zinc, with a small portion of tin.

The scarcity of zinc is attributed by the manager of one of the firms manufacturing shells as being due to speculation, and he is of the opinion that the supply is now becoming more plentiful. The war breaking out, he believed, caused to a great extent a cornering of the market.

"The high price of zinc has been caused by a scarcity," said the manager of another firm. "There is no denying that, because the United States has been exporting great quantities of it to Europe ever since the war broke out. Before the war Europe was a large exporter of zinc, and despite the duty, Belgium and Germany were able to place their zinc in the United States and compete with the manufactured product in that country."

Owing to the fact that it was never really a paying proposition to mine zinc in Canada, he was asked about mining it now in Canada in order to furnish a supply to meet the demand, but he said that the zinc ore in Canada was of a poor quality. It was coarse and contained many impurities so that he questioned if the establishment of refineries in Canada would produce the quality of zinc out of the ores needed for the manufacture of shells. It was his opinion that before six months zinc would go up to 50 cents a pound.

Trade Gossip

Canada's Trade Balance.—The effect of war munitions exports is being shown in the fact that Canada is now building up a favorable trade balance from month to month. In June the excess of exports over imports was $11,716,000, in May $7,689,678, and in April $300,000, a favorable balance for the quarter of $19,705,678. In the previous quarter there was an adverse balance against this country of about $5,000,000. With the prospect for a heavy balance on the right side this fall, owing to the record crop promised, the outlook in this respect is distinctly favorable.

Steel of Canada Outlook.—In circles close to the Steel Company of Canada, the greatest satisfaction is expressed over the outlook. The company had to take some losses in the first quarter of the calendar year, but these have long since been made up, and it is predicted that the results of this year will be fully up to those of 1913, when the company enjoyed a profitable period. The corporation is turning out 200 tons of finished steel product per day, and this presumably will be increased as soon as the new open hearth steel furnace is finished.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Comissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, 278 Balcarce, Buenos Aires. Cable Address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne, Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 6 Kiukiang Road, Shanghai. Cable Address Cancoma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona

Japan.

G. B. Johnson, P.O. Box 109, Yokohama. Cable Address, Canadian.

Holland.

J. T. Lithgow, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

E. de B. Arnaud, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

Fred. Dane, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Colombia.

A. E. Beckwith, c-o Tracey Hmos, Medellin, Colombia. Cables to Marmato, Colombia. Cable address, Canadian.

Norway and Denmark.

C. E. Sontum, Grubbeged No. 4, Christiana, Norway. Cable address, Sontums.

South Africa.

D. M. McKibbin, Parker, Wood & Co., Buildings, P.O. Box 559, Johannesburg.

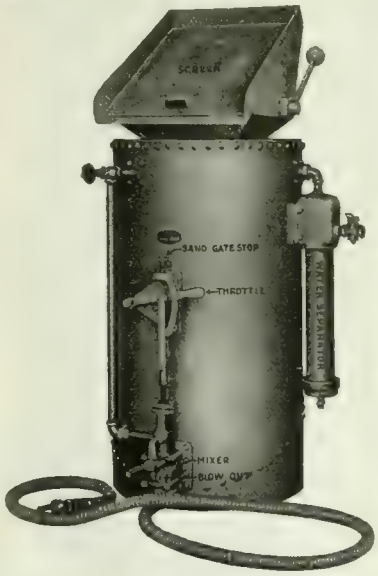
E. J. Wilkinson, Durban, 41 St. Andrew's Buildings, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.

THE A. R. WILLIAMS MACHINERY CO., LTD
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER
Canada's Leading Machinery House

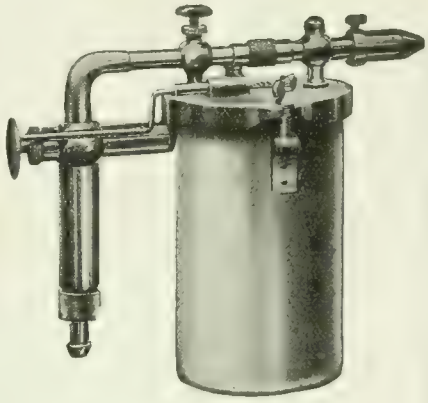


Two Notable Labor-Saving Devices for Increasing Production

CURTIS SAND BLASTS

Have maximum abrasive action and em body many features that save time and labor not included in the design of other makes. For cleaning scale from shrapnel cases and preparing the interior of high explosives for varnishing.

Get information on the CURTIS JACK for handling hollow forgings for external or internal sand-blasting.



THE ECLIPSE AIR BRUSH

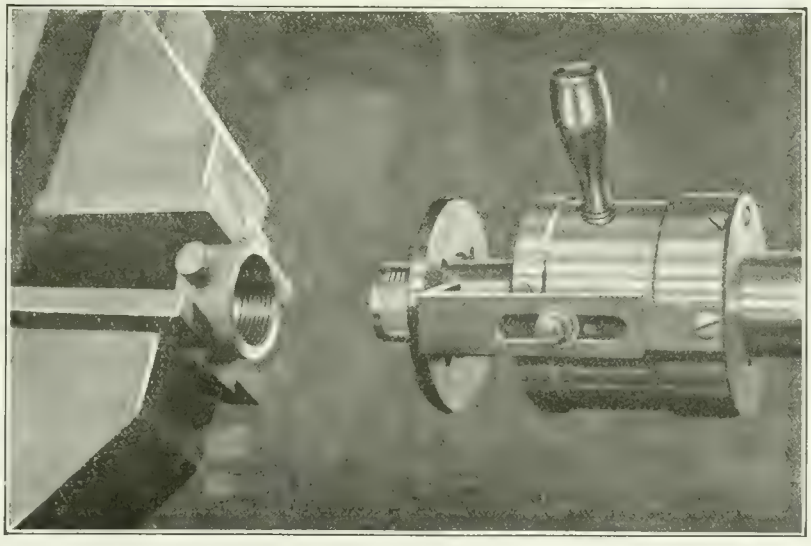
For applying varnish to the interior of high explosives or painting the exterior, the Eclipse is unrivalled in the economy of material and time and labor-saving efficiency.

Get information on special motor-driven rotating stand for handling this work on a quantity basis.

REMEMBER OUR SERVICE DEPARTMENT IS ALWAYS AT YOUR DISPOSAL

THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED
Machine Tool Department

Let the Geometric Collapsing Tap Show You How



A Geometric Standard Tap on the Job

Universally adopted for tapping operations above ¾-inch diameter.
Fitted for Turret Head Machines or Live Spindles.

Send along your specifications and get our quotation.

THE GEOMETRIC TOOL COMPANY **NEW HAVEN, CONN., U.S.A.**

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Halifax, N.S.—T. Hogan & Co. will erect a machine shop here.

St. Jerome, Que.—Alfred A. Viau may establish a foundry here.

Brantford, Ont.—The Brantford Computing Scale Co. new factory is nearly completed.

Gondreau, Ont. — The Madoc Mining Co. will build a power house here at a cost of $70,000.

Port Hope, Ont.—The Standard Ideal Co. will probably receive an order for shells. H. T. Bush is general manager.

Charlottetown, P.E.I.—An effort is being made to obtain an order for shells for the Government railway shops here.

Fort Frances, Ont.—The town council will install a steam heating plant. Particulars may be obtained from C. E. Parry, town engineer.

St. Catharines, Ont. — Arrangements are pending for the extension of the Russell Jennings Co. factory to permit of their undertaking the manufacture of munitions.

Chatham, Ont.—At a special meeting of the City Council last Monday it was decided to turn over the Defiance Iron Works to Alex. Chaplin, of this city, for the purpose of manufacturing shells for the Dominion Government. The Defiance Iron Works is owned by the city.

Chatham, Ont.—The City Council recently received a letter from the Marskey & Schmidt Co., of Detroit, offering the city a contract for manufacturing a million shells as part of a ten million shell order which the company claims to have received from the Russian Government. This offer has been handed over to Alex. Chaplin.

Electrical

Otterville, Ont.—A hydro-electric system may be adopted by the town.

Harriston, Ont.—The hydro-electric by-law was carried here last Monday by a majority of 220.

Toronto, Ont.—An electric bell costing $1,400 will be installed on Eglington Avenue at a point where the G. T. R. and C. P. R. intersect.

St. Catharines, Ont.—The Hydro-Electric Commission are considering utilizing the spillways of the Welland Ship Canal for power purposes. This would be of considerable benefit to St. Catharines and district.

The Harrison Landry Mfg. Co., has been incorporated at Ottawa with a capital of $50,000 to carry on business as machinists and engineers, at Montreal, Que. Incorporators Andrew Harrison Landry and Michael Croghan of Montreal.

The Canadian Dadco Co. has been incorporated at Ottawa with a capital of $75,000 to manufacture mechanical metal devices of appliances for cranking and starting automobile or other gas engines at Toronto, Ont. Incorporators, John Cowan and John Thomas Fuller of Toronto.

Preference to Canadian Smelted.—The suggestion was made in the British House of Commons on July 20 by Sir Edward Cornwall that in the event of purchases of spelter being made in America there should be discrimination in favor of metal made in the United States from ores produced in British Columbia. The Ministry of Munitions promised to consider the suggestion.

Municipal

Delta, B.C.—The town will spend $20,000 on waterworks extensions.

Hull, Que.—The city council are in the market for a quantity of cast iron pipe and specials.

Winnipeg, Man.—Extensions will be made shortly to the high-pressure water main system.

Port Rowan, Ont.—The town council are considering the installing of an electric light plant.

Millardville, B.C.—The town council contemplate making extensions to the waterworks system.

Kamsack, Sask. — Additions will be made to the waterworks plant here to cost $35,000. H. H. Crawford is clerk.

Regina, Sask.—The city council has ordered additions to the waterworks plant to cost $44,500. George Beach is city clerk.

Galt, Ont.—A by-law will likely be submitted to the ratepayers to raise $20,000 for the improvement of the waterworks system.

Chambly, Que.—The town council will make extensions to the waterworks system. Motor-driven pumps and steel pipe will be required.

Chatham, Ont.—The town council have passed a by-law for the purchase of motor fire apparatus and truck, at an estimated cost of $13,000.

Canora, Sask.—The town council will install a waterworks plant to cost $17,700. The engineers are Chipman & Power, Toronto, Ont.

Toronto, Ont.—The Board of Control has recommended the purchase of two new electrically-operated pumps for the high-level pumping station.

Carlyle, Sask.—A by-law will be voted on by the ratepayers on August 9 to raise $3,000 for the purpose of completing the electric light and power plant.

Brockville, Ont.—The approval of the Provincial Board of Health is to be obtained re the laying of the proposed intake pipe before the by-law is passed.

Vernon, B.C.—The Municipal Council will build a new auxiliary pumping station to cost $3,000. One large pump and a 50-h.p. motor are required. D. G. Tate is city clerk.

The Pas, Man. — A light and power system will be installed here to cost $50,000. A waterworks and sewage system to cost $80,000 will also be installed. H. H. Elliott is clerk.

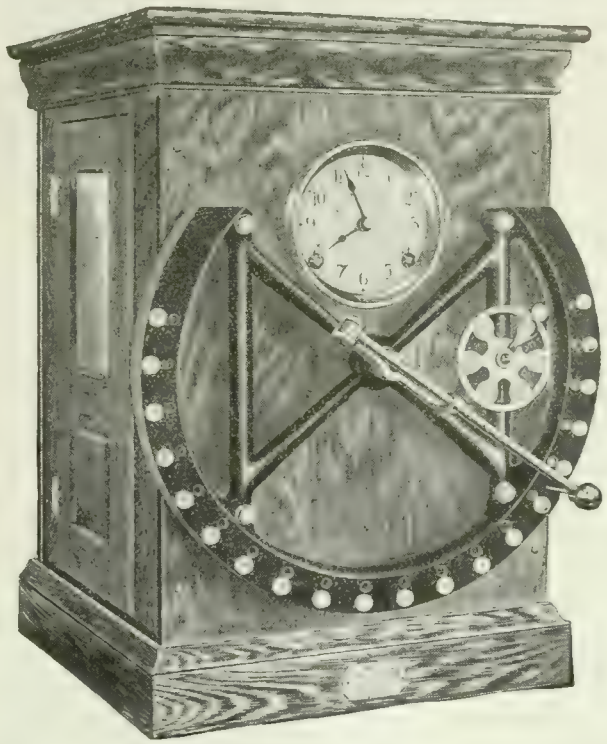
Toronto, Ont.—The recommendation of the Works Committee that tenders be invited for the construction of the proposed new duplicate waterworks system, estimated to cost $4,500,000, was rejected, and the matter was referred back for reconsideration.

Tenders

Ottawa, Ont.—Tenders on the supply of transformers, switches, and equipment will be received until August 3 by the chairman of the Waterworks Commission. Plans and specifications with the city engineer, R. L. Haycock.

Ottawa, Ont.—Tenders will be received until August 3 for high lift pumps and motors for the Lemieux Island pumping station. Plans and

$85 is the Price of this Dial Time Recorder



It costs at least twice that amount every year to be without it.

It will give you a Daily Detail Strip of the actual time you secured from each employee. The machine has no likes or dislikes—it cannot lie—it has no brains, therefore cannot make mistakes.

You get an indisputable printed record of each employee's time. The record is mechanically self-made by the employee. It is made inside the register, under lock and key, where it cannot be soiled, torn or lost.

The most progressive and successful firms are using International Time Recording Systems and saving money. What can be done for other firms can be done for you. You cannot afford to be without an International Time Recording System for your business.

Write us to-day. Let us tell you more about this new model at $85, or the Recorder best suited for your business.

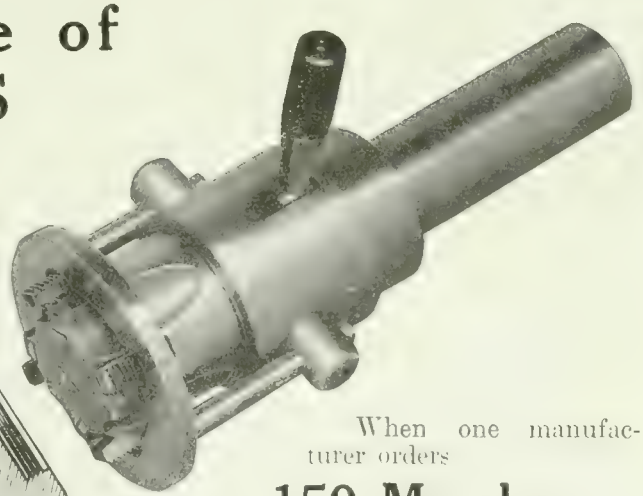
International Time Recording Company of Canada, Limited

Toronto, Canada

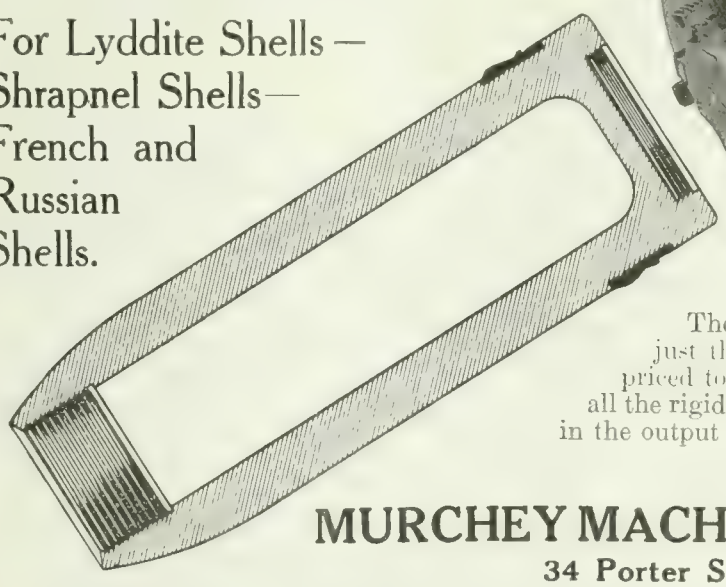
Ryrie Building, Cor. Shuter and Yonge Sts. **F. E. Mutton, Manager** Branches in Principal Cities.

Threading the Base of LYDDITE SHELLS

Here is the Tool—Murchey Collapsing Tap with overhanging chasers—doing the work and doing it well.



For Lyddite Shells—
Shrapnel Shells—
French and
Russian
Shells.



When one manufacturer orders

150 Murchey Collapsing Taps

There must be a reason. There is a reason. It's just this—these taps are taking the place of higher-priced tools, and they are speeding up production with all the rigid accuracy and quality of work that is demanded in the output of shell work.

Write for details and catalog.

MURCHEY MACHINE & TOOL COMPANY

34 Porter St., Detroit, Michigan

specifications may be obtained from the consulting engineer, S. B. MacRae, Ottawa.

Brighton, Ont. — Tenders will be received by the undersigned up to July 29, for the erection and completion of a foundry building at Brighton. Plans and specifications may be seen at the office of Geo. Drewry, Secretary of The D. J. Barker Foundry Co., Ltd., Brighton, Ont.

Toronto, Ont.—Tenders will be received up to Tuesday, August 3rd, 1915, for the supply of 58 tie rods and tie plates for Lansdowne Avenue Extension, Toronto Civic Railway. Specifications and forms of tender may be obtained at the Works Department, City Hall.

Ottawa, Ont.—Tenders for harbor and river improvements in the Mission River, Fort William, Ont., will be received at this office until Wednesday, August 4, 1915. Plans, specification and form of contract can be seen and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the district engineers, Fort William, Ont.; Confederation Life Buildings, Toronto, Ont.; Shaughnessy Building, Montreal, P.Q.

Drumheller, Alta.—Tenders will be received up till Monday, August 16, 1915, for the following contracts: (1) Supply of about one mile of 6-in. and 4-in. steel or cast iron pipe; (2) valves and hydrants; (3) One return tube boiler and stack; (4) One duplex pump; (5) Materials for 30,000-gallon wood tank and housing; (6) All labor and certain materials for laying water mains, sinking an open well, constructing pumping station, and erecting wood tank and housing. Plans and specifications and other information may be obtained at the offices of the John Galt Engineering Co., Ltd., consulting engineers at Winnipeg and Calgary.

Contracts Awarded

Transcona, Man.—The Ideal Incinerator Co. of Toronto has been awarded a contract for an incinerator to cost $18,875.

Montreal, Que.—The City Council have awarded a contract for fire alarm boxes to the Northern Electric Co., Montreal.

Preston, Ont.—Wirsching Bros., have been awarded the contract for the foundation for the new Hurlbut shoe factory. No other contracts have as yet been let.

Orillia, Ont.—Thos. W. Stephens has been awarded the contract for the construction of the Orillia-Longford pole line by the Light and Power Commission. His tender was $1,250.

Toronto, Ont.—At a meeting of the Finance Committee of the Board of Education held recently contracts representing an expenditure of $30,512 were awarded. The chief amount was for $29,036 which is for the proposed new wing to be constructed to McMurrich Avenue School.

A. R. C. Clark & Son, St. John, N.B. have been awarded the contract for the installation of the water and sewerage system at Bathurst, N.B. The contract, which will amount to $131,000, covers the construction of a dam and pumping station and about seven miles of water and sewerage mains. A large standpipe with a capacity of 405,000 gallons will also be erected.

Assiniboia, Man.—The municipal council have awarded the following contracts in connection with the waterworks extensions: Canadian Iron Pipe Co., 500 tons iron pipe, $19,000; Western Steel & Iron Co., and Canadian Sarco Engineering Co., 130 hydrants, $5,000. All curved extras and special connections will be supplied by the Manitoba Bridge & Iron Works.

Trade Gossip

Edmonton, Alta.—The Edmonton Shell Co. has been incorporated with a capital stock of $50,000 to manufacture shells, explosives, guns, etc.

The Crown Furniture Co. has been licensed to carry on business in the Province of Ontario with a capital not exceeding $40,000. Austin Moss of Preston, Ont., is attorney.

Port Arthur, Ont.—The Western Dry Dock and Shipbuilding Co. is making good progress with the manufacture of its initial lot of farm tractors, plans for which were announced a few weeks ago.

The Goldie & McCulloch Co. of Galt, Ont., are prepared to manufacture fuse caps and such parts required for fixed ammunition except filling with powder. This concern has in operation a large forging and machining plant.

The Lake of the Woods Boat Co. has been granted a license with a capital stock of $80,000, and has appointed William J. Craig, Keewatin, Ont., its attorney. The company will manufacture boats, launches, engines and other equipment.

The Canadian Mill Supplies & Steam Specialties, Ltd., Toronto, Ont., has been incorporated with a capital stock of $40,000 to manufacture machinery and supplies for all industries. The provisional directors are Frank J. Hughes, Thomas B. Smyth and Duncan P. Clark, all of Toronto.

Iroquois Falls, Ont.—The first run of paper from the large Abitibi pulp and paper mill was made last week. Only one unit is running at present, but this will be augmented by two others which are being put up and adjusted. The mill, which is the largest in Canada, will, it is expected, be running full by September.

Semi-finished Steel Short of the Demand.—It is reported from Pittsburgh, Pa., that for the first time in two years manufacturers report a scarcity of semi-finished steel. Pittsburgh producers of open-hearth steel billets and sheet bars have been out of the market, so far as new business is concerned, for some time, but the pressure for delivery on orders booked has been so great that shipments are behind. Youngstown steel makers yesterday advanced the price of sheet bars to $23.50, Pittsburgh, the highest point in more than two years. A month ago sheet bars were available at $20.50, Pittsburgh.

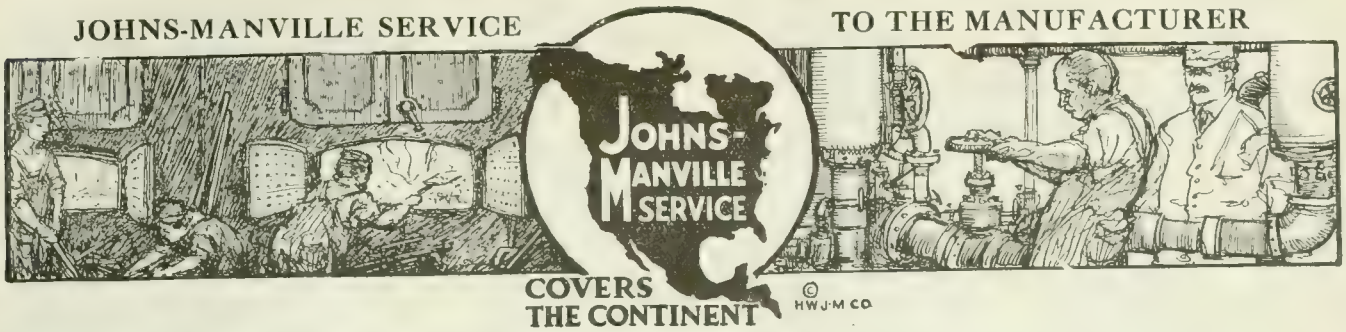
David A. Thomas at Ottawa.—D. A. Thomas, who represents Lloyd George, British Minister of Munitions, in America, arrived in Ottawa on July 25. He is accompanied by Gen. R. H. Mahon and R. H. Carr, and will remain there for some time in close touch with the Canadian Shell Committee. The party will also visit Montreal, Toronto and other cities. Although Mr. Thomas has been given wide powers by the British Minister of Munitions, he states it is not his intention to buy munitions in Canada. The Canadian Shell Committee will attend to that. What his mission is is to inquire into the capacity of the Dominion to turn out shells, rifles, small arms ammunition and explosives.

Personal

A. M. Bray, assistant professor of electrical engineering at McGill University, Montreal, has resigned to become professor of electrical engineering at Cornell University.

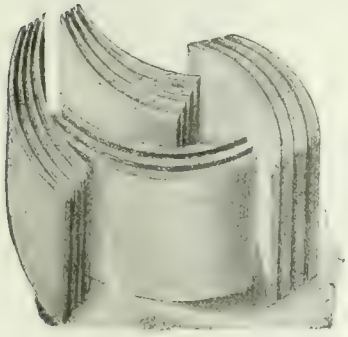
Warren Chambers resigned his position as superintendent with the Chapman Double Ball Bearing Co., Toronto, recently. He has joined the Cobourg Steel Co., which secured a shell contract some time ago.

W. J. McCallum, until recently chief draftsman with the Chapman Double Ball Bearing Co., Ltd., Toronto, has assumed the position of superintendent,



THIS emblem is more than a trade-mark device. It stands for the experience, ability and business integrity of a long-established house. So that any article upon which it appears is not merely offered for sale; it is meant to give service. And that every J-M Product shall give this service fully and permanently, is the whole meaning of J-M Responsibility.

The most important thing about a stack is the draft area. Why choke it up with a thick fire-brick stack lining?



J-M Vitribestos Stack Lining offers even greater lining protection than fire brick, and weighs about 1/10 as much. A six-foot stack lined with J-M Vitribestos allows a net draft diameter of 5′ 8″ and gives maximum draft area.

If you are figuring a new stack, order a lighter gauge material—a lighter foundation and a J-M Vitribestos Lining. You'll have a better stack and a cheaper one.

Vitribestos Stack Lining is impervious to all effects of smoke and fumes of combustion.

It has been a revelation to users. Are you interested in revelations that save money?

Be sure of these three things in planning your pipe covering installation

(1) Proper design of covering.
(2) Good quality of covering.
(3) Proper application of covering.

These things are all of great and equal importance. You may buy a good covering and pay a fair price for it, but it may not be the covering for your conditions. You may buy a good-looking covering and have it fail on account of its inefficiency, and again the best covering obtainable may be inadequate as a heat insulator if not properly applied.

Johns-Manville Pipe Covering Service satisfies these three conditions of Design, Quality and Installation. This service includes advisory work in planning the job, it includes the *right* covering, of insured quality, and, if you please, it includes the proper installation of same through the contract departments of its branches.

If you prefer to apply these coverings yourself you will appreciate the convenience of materials that go on and come off easily and quickly without breakage or mutilation.

Johns-Manville Pipe Covering Service starts with the plan and stays with the job to the finish.

One Style of J-M Heat Insulation

Our literature on these products will interest you. Write for it to-day.

THE CANADIAN H. W. JOHNS-MANVILLE COMPANY, LIMITED

Asbestos Roofings; Packings; Mastic Flooring; Conduit; Stack Lining; Fireproof Paint; Fire Extinguishers; Fuses; etc.

TORONTO MONTREAL WINNIPEG VANCOUVER

3067E 3050B

rendered vacant by the resignation of Warren Chambers.

H. E. Tanner, formerly assistant town engineer of Chicoutimi, Que., and for three years on the engineering staff of the Transcontinental Railway, has been appointed to succeed Mr. H. Hadley as city engineer of Verdun, Que.

J. Frank Chapman, general manager of the Thousand Islands Railway and the Oshawa Railway, passed away recently at his residence in Gananoque, Ont. The deceased, who was a railroad man of thirty-four years experience, was born in Frankford, Ont., in 1863.

Hurlbut S. Jacoby, formerly chief engineer of the Standard Steel Construction Co., of Welland, Ont., and recently appointed Instructor in Civil Engineering at Pennsylvania State College, has been retained as associate engineer for summer work by the Samuel Austin & Son Co., industrial engineers and builders, of Cleveland, Ohio.

Clark T. Morse, formerly Montreal and Toronto district manager for the Canadian Sirocco Co., has been transferred to the head office at Windsor, Ont., to take charge of the engineering and sales work in place of Ralph T. Coe, resigned. A. M. Nichol continues in charge of Eastern Canadian sales with headquarters in McGill Bldg., Montreal.

IMMEDIATE DELIVERY

LATHES.

13" x 5' Pratt & Whitney Lathe, R. & F. Rest.
14" x 5' Putnam, R. & F. Rest.
16" x 8' Prentice, C.R.
18-36" x 8' Fay & Scott Extension Gap.
20" x 10' Porter, C.R.
28" x 12' Fifield, C.R.

TURRET LATHE AND SCREW MACHINES.

2 x 24 Jones & Lamson, Bar and Chucking outfits.
2 x 24 Jones & Lamson Turret Lathe.
28" Pond Regal Turret Lathe, 4" hole in spindle.
28" Fay & Scott Turret Lathe, 4-step cone.
30" Heavy Turret Lathe, 3-step cone for 3½" belt.
30" Lodge & Shipley Heavy Turret Lathe.
26" Draper Turret Lathe, 4" hole in spindle.
No. 3 Pearson Screw Machine.
2¼" Pearson Screw Machine.
No. 2½ Pratt & Whitney Screw Machine.
2" Bardons & Oliver Screw Machine.
No. 00 Brown & Sharpe Automatic Screw Machines (4).
No. 1 Brown & Sharpe Automatic Screw Machine.
No. 2 Brown & Sharpe Automatic Screw Machine.
5/8" Cleveland Auto. Screw Machines (2).
2" Cleveland Auto. Screw Machines (2).

MILLING MACHINES.

Whitney Hand Millers (13).

Above, partial list only.

A. D. White Machinery Co.
108-114 N. Jefferson St., CHICAGO

Ralph T. Coe, manager of the Canadian Sirocco Co., Windsor, Ont., since the organization of the company, has resigned to enter the engineering service and sales field in New York State. Mr. Coe has been appointed district manager for Warren, Webster & Co. and the American Blower Co., and will have offices at 519 Insurance Bldg., Rochester and 19 Live Stock Exchange Bldg., Buffalo, N.Y.

Sir Sandford Fleming, engineer and scientist, died at Halifax on July 22, after a short illness, at the age of 88. Sir Sandford was known as the dean of the engineering profession in Canada and the "father of the Canadian Pacific Railway." Sandford Fleming was born in Kirkcaldy, Fifeshire, Scotland, on January 7, 1827. He was educated there, and came to Canada in 1845. He joined the engineering staff of the Northern Railway, Toronto, subsequently becoming chief engineer. Later he practised engineering in Ontario, and was elected a member of the Institute of Civil Engineers, London, and of the American Society of Engineers, and elected honorary member of the Canadian Society of Civil Engineers. In 1863 he was chosen by the Governments of Canada, Nova Scotia and New Brunswick and Great Britain to conduct a survey for the first link of a railway which would join the Atlantic and the Pacific. His survey showed the practicability of the scheme, which developed, when carried out, into the Canadian Pacific Railway system. He helped to build the railway system of Newfoundland. In recognition of his public services Queen Victoria made him a Companion of the Order of St. Michael and St. George in 1877 and a Knight Commander in 1897.

Wood-Working

Smithville, Ont.—The sawmill of Robert E. Brooks has been destroyed by fire, with a loss of $5,000.

Tenino, B.C.—The plant of the Tenino Lumber Co. has been totally destroyed by fire with a loss of $60,000.

Montreal, Que. — Z. Charbonneau's sash and door factory on Alice street has been destroyed by fire with a loss of $20,000.

Newcastle, N.B.—W. M. Sullivan's mill at Redbank has been destroyed by fire. The loss is estimated at about $40,000.

Monteith, New Ont.—C. Brisbois will build a sawmill and pulp mill here. John Thompson, Peterborough, Ont., is interested in the undertaking.

West Broughton, Que.—T. Beaudouin's saw mill which was totally destroyed by fire with a loss of $8,000, will be rebuilt. Steam power machinery is required.

Goderich, Ont.—A furniture factory is being erected here for J. E. Baechler, Goderich Lumber & Milling Co., who is in the market for wood-working machinery.

North Bay, Ont.—The loss by fire of the Gordon Lumber Co. saw mill at Cache Bay on July 19 amounted to $150,000, of which $75,000 is covered by insurance.

Ottawa, Ont—The Davidson Woodworking Factory will build a large addition to its plant. Woodworking machinery will be required. L. Henderson is manager.

Haileybury, Ont.—The Dunbar Lumber Co. mill was entirely destroyed by fire on July 13. The loss is estimated at $15,000, of which about $4,500 is covered by insurance.

St. John, N.B.—Fire completely destroyed the Miramichi Pulp Mill property at Chatham, N.B. Only the office building remains. The loss is estimated at $50,000, and is partly covered by insurance.

Berwick, N.S.—Berwick Planing Mills, owned by J. W. Hutchinson, were destroyed by fire on July 14. The loss is over $10,000. In addition to the machinery much valuable lumber was destroyed. There was no insurance.

Building Notes

Beamsville, Ont.—The Board of Education contemplate erecting a school at an estimated cost of $20,000.

Orillia, Ont.—The town council have decided to build a new town hall to replace the building recently destroyed by fire.

Transcona, Man.—It is proposed to build a new school at a cost of $35,000. A by-law will be submitted to the ratepayers.

Winnipeg, Man.—A permit has been granted to build a school at St. Boniface to cost $139,544. The building will be 156 feet x 83 feet and three stories high.

Regina, Sask.—The Robert Simpson Co. of Toronto will erect a building here in connection with their mail order business. The cost is estimated at $150,000.

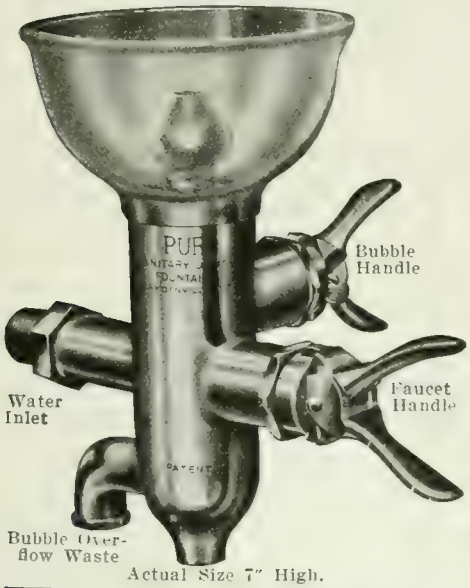
Chatham, Ont.—The McClary block on King street, recently destroyed by fire, will be rebuilt. A permit has been issued for the work, which it is estimated will cost $10,000.

Levis, Que.—Work is being actively pushed ahead on the construction of the

PURO

(MADE IN CANADA)

Don't Pay Good Money for Impractical, Unmechanical and Often Worthless Fountains



Actual Size 7" High.

Here is a practical Fountain, which combines the Faucet and Bubble Features—takes care of the overflow waste, and insures

Safety and Service

This is an age of sanitary plumbing and the Sanitary Drinking Fountain is one of its important subdivisions.

SAFETY FIRST **PURO** SERVICE ALWAYS

Is made of heavy brass with extra heavy nickel plate. Bubbler easily controlled by separate "squeeze" handle. No spurts—no choking—inside regulation prevents "showerbath." Faucet is controlled by another squeeze handle. Faucet gives full water pressure. Has thread for hose if wanted.

Write us the number of your employes and water pressure and we'll present an interesting proposition to you promptly.

Puro Sanitary Drinking Fountain Company

147 University Ave., TORONTO, CAN.

KINDLY MENTION THIS PAPER WHEN WRITING ADVERTISERS

A WANT AD. IN THIS PAPER WILL BRING REPLIES FROM ALL PARTS OF CANADA.

new Intercolonial freight shed here. The new freight shed is to be 400 x 50 feet, built of concrete, brick and structural steel, and will be thoroughly fire-proof and modern in every detail. The work is in the hands of Mr. G. B. Mitchell, contractor, of Montreal.

General Industrial

Collingwood, Ont.—A by-law will be voted on by the ratepayers on August 11 to grant a loan of $20,000 to the Bryan Manufacturing Co.

Selkirk, Man.—J. S. Hughes, Mill Village, N.S., is interested in a company which will construct a pulp and paper mill at Selkirk, Man., to cost $150,000.

Aurora, Ont.—A syndicate has been formed to establish a plant here for making mechanical orchestras. The Ontario Realty Co., 35 Yonge street, Toronto, are interested.

Railways-Bridges

Alexandria, Ont.—The G. T. R. station here has been completely destroyed by fire.

London, Ont.—The London and Port Stanley Railway was officially opened by Sir Adam Beck on July 22.

Oil-burning Locos. on G.T.P.—Morley Donaldson, vice-president of the Grand Trunk Pacific Railway, announces that the installation of oil-burning locomotives on the mountain section of the lines has now been completed. These locomotives are of the most modern type and were placed in service for passenger traffic for the first time on July 24. They are operating from Jasper to Prince Rupert, over 719 miles of main line. Especial interest attaches to the installation of this class of motive power, as it marks the first use of oil-burners on an extensive scale in Canada. Oil storage tanks have been erected at various points for supplying locomotives with the necessary fuel.

New Incorporations

The Alton Foundry Co. has been incorporated with a capital of $50,000 to carry on business at Alton, Ont. Incorporators: J. M. Dods, E. Dods and T. B. Deagle, all of Alton, Ont.

The Canadian Ventilator Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture ventilators, screens, etc., at Ottawa. Arthur Ellis, Robert A. Devine and Howard Murray, all of Ottawa, Ont., incorporators.

Rumely-Wachs Machinery Co.

121 N. JEFFERSON ST.

CHICAGO ILLINOIS

New and second-hand machine tools in stock for immediate delivery:

LATHES

18" (20" swing) x 8' Hamilton, C.R. H.S. (Used).
18" x 10' Rahn Carpenter, C.R. H.S. (Used).
21" x 10' Bradford, C.R. H.S. (Used).
22" x 12' Flather, C.R. H.S. (Used).
24" x 8' Putnam (Used).
24" x 8' Sherman (Used).
25" x 14' LeBlond, heavy duty (New).
30" x 14' American (Used).
36" x 12' Schumacher & Boye (Used).
36" x 16' Fifield (Used).

TURRET LATHES and SCREW MACHINES

Two 24" Morse Turret Lathes, with 1" hex. turret, on carriage (Used).
No. 5 Bardons & Oliver (2") with wire feed, oil pump and pan (Used).
Two Bardons & Oliver No. 2 Hand Screw Machines, plain head, (1") wire feed, oil pump and pan (Used).

PLANERS

30" x 30" x 8' Flather, one head (Used).
36" x 36" x 8' American, two heads (Used).
36" x 36" x 15' Woodward & Powell Frog and Switch, two heads (Used).

SHAPERS

20" Gould & Eberhardt, back-geared, crank (Used).
16" Stockbridge crank (Used).
14" Acme, crank (Used).

DRILL PRESSES

21" Cincinnati, B.G. and power feed (Used).
21" Hoefer, b.g. power feed (Used).
22½" Barnes, b.g. power feed (Used).
24" Cincinnati, sliding head, complete (Used).
28" Sibley & Ware, sliding head, complete (Used).
28" Barnes, sliding head, complete.
28" Sibley & Ware, sliding head, complete (Used).
31" Barnes, sliding head, complete (Used).
4½' Bickford Plain Radial (Used).
5' Prentice Plain Radial (Used).

MILLING MACHINES

No. 2 Brown & Sharpe, plain (Used).
No. 2 Kempsmith, plain (Used).
No. 2-H Brown & Sharpe, plain (Used).
No. 3 Pratt & Whitney, plain (Used).
No. 3 Kempsmith, plain (Used).
No. 3 Cincinnati, plain (Used).
No. 3 Newton, plain (Used).
No. 3 Owen, Universal (Used).

MISCELLANEOUS

No. 22 Espen-Lucas Cold Saw, capacity 6" (Used).
No. 15 Lea Simplex Cold Saw, capacity 5" (Used).
42" Colburn Boring Mill, 2 heads (Used).
42" Bullard Boring Mill, 2 heads (Used).
30" Bullard Boring Mill, one turret head (Used).
1½" Acme Bolt Cutter (Used).
2½" Acme Bolt Cutter (Used).

Classified Advertisements

Those who wish to sell or buy a business, obtain competent help, connect with satisfactory positions, or secure aid in starting new enterprises, should not fail to use the Want Ad Page of "CANADIAN MACHINERY."

WANTED — EQUIPMENT FOR MACHINE (repair) shop; weight or accuracy not important as price. Give full details. Box 153, Canadian Machinery. (8)

THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON
CANADA
Best Steel Lockers Made

SHEET METAL STAMPINGS
Automobile Fenders, Hoods and Gasoline Tanks
We are now manufacturing a number of lines for Canadian firms filling war contracts.
The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.
The Dominion Stamping Co.
LIMITED
Walkerville, Ont.
DROP FORGINGS

The Lachine Manufacturing Co., has been incorporated at Ottawa with a capital of $120,000 to manufacture bombs and other munitions of war at Lachine, Que. Incorporators—Joseph Descarries and Theophile N. Descarries, of Lachine.

The W. J. Trick Co. has been incorporated at Toronto with a capital of $250,000 to manufacture interior fittings and all kinds of woodwork at Oshawa, Ont. Incorporators: John Fraser Macgregor and Thomas Stewart Hagan Giles, of Toronto.

The Waterproof Stockings, Ltd., has been incorporated at Toronto with a capital of $50,000 to manufacture rubber goods and dry goods of all kinds at Toronto. Incorporators: Frederick Charles Stewart and George Alfred Stewart of Toronto.

The Architectural Woodworking Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture all kinds of office equipment. store fixtures and revolving doors, etc., at Toronto, Ont. William A. Riddell and Harvey Obee, of Toronto.

The Canadian Mills Supplies & Steam Specialties, Ltd., has been incorporated at Ottawa with a capital of $40,000 to manufacture machinery and supplies for all industries at Toronto, Ont. Incorporators, Frank Joseph Hughes, Daniel Kelly, of Toronto.

The St. Thomas Construction Co. has been incorporated at Ottawa with a capital of $40,000 to manufacture shrapnel and high explosive shells at St. Thomas, Ont. Incorporators: Albert Edward Ponsford and Edward Austin Horton of St. Thomas, Ont.

Dominion Aluminum Last Co. has been incorporated at Ottawa with a capital of $50,000 to manufacture boot and shoe lasts, etc., at Windsor, Ont. George A. Farabaugh, William H. Holland and George Chester Clarke, all of South Bend, Ind., incorporators.

The Boving Hydraulic and Engineering Co. has been incorporated at Ottawa with a capital of $500,000 to carry on business as mechanical, hydraulic engineers and contractors at Lindsay, Ont. Donald McLean, James Boxall and William Flavelle, all of Lindsay, Ont., are the incorporators.

Refrigeration

Halifax, N.S.—The City Council have appointed a committee to look into the question of establishing a municipal abattoir. It is estimated that it will cost about $70,000.

The Anglo American Pork Products Co. has been incorporated at Ottawa.

Have You Idle Machinery?

If you have a lathe or other machine tool suitable for shell manufacture and would like to dispose of it, then use the classified column of Canadian Machinery.

You will be doing yourself, other manufacturers and the Empire at large a real service if you will place your non-productive machinery at the disposal of those who have urgent need of it.

Describe your equipment fully. Rate for one insertion 2 cents per word. Subsequent insertions 1 cent per word.

Canadian Machinery
143 University Ave.
TORONTO

FREDK. HOUSE & CO.
HOUSE'S JOINTING CEMENT for Steam and Gas Joints.
HOUSE'S IRON CEMENT for Castings, &c.
HOUSE'S ELASTIC CEMENT for coating Boilers.
HOUSE'S ELECTRIC CEMENT for Road Boxes.
HOUSE'S A1 ANTI-FOULING BOILER FLUID, BELT DRESSING, &c.
Send P.C. for All Information to:
8 Parliament Street, LIVERPOOL, ENG.

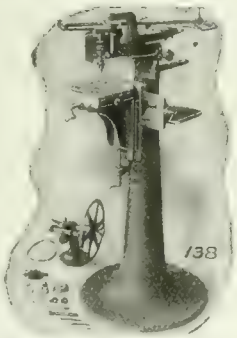
WM. MUIR & CO., Limited
Manchester, England.
Machine Tool Makers.
Specialties: Patent Puncher Slotting Machines, Milling Machines, Boring Machines.
Agents: Messrs. Peacock Bros., 68 Beaver Hall Hill, Montreal.
Send for catalogue.

BERTRAMS LIMITED
Engineers
Sciennes, EDINBURGH
PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKERS
Catalogues offered to Purchasers.

JOHN STIRK & SONS, Limited
HALIFAX, ENG
MACHINE TOOLS
Agents—The A. R. Williams Mcy. Co., Ltd.
Toronto, Winnipeg, Vancouver, St. John, N.B.

Make Your Own Engravings

It doesn't take an expert to operate the GORTON ENGRAVING MACHINE. The ordinary workman can turn out lettering or designs either sunk or in relief, on dies, moulds, tools, patterns, core boxes, label plates, instruments, etc., etc., better than the most skilled hand engraver in the fraction of time the hand workman would take.



WRITE FOR DETAILS.
Geo Gorton Machine Co.
RACINE, WIS.

Sheet Metal Stampings
IN BRASS, IRON OR SHEET STEEL
Quotations given on your own design.
EXPERT DIE MAKERS
DUNCAN ELECTRICAL CO. LIMITED
86 Grey Nun St. MONTREAL, P.Q.

with a capital of $5,000, to manufacture and refine oils, greases, paint and oil products, etc., at Toronto. Incorporators: Harry Riley and Alfred Bicknell, of Toronto.

Marine

Midland, Ont.—The new locks at Port Severn were officially opened on July 26. This point is the Georgian Bay end of the Trent canal.

Kingston, Ont.—After being in commission for 25 years or more, the Dominion Public Works dredge 105 is to be placed on the scrap heap at Ottawa. For the past 8 months this dredge has been engaged deepening the harbor at Bowmanville.

St. John's, Nfld.—The purchase by the Russian Government of the ice-breaking steamer Bruce from the Reid Newfoundland Co. is announced. It is understood that the Bruce, with her sister ship, Lintrose, bought by Russia last winter, will be used in the White Sea during the fall and winter in an effort to keep open later than usual the channel to the port of Archangel. The Bruce and the Lintrose were built a few years ago for service in Cabot Strait, between Newfoundland and Cape Breton, where heavy ice is encountered in the winter. They are steamers of 1,553 tons.

Too Big for Canal.—William G. Davidson, president of the Staten Island Shipbuilding Co., has just purchased four of the large vessels of the Erie Railroads Lake Line, the Brownell, Underwood, Binghampton and Oswego. President F. D. Underwood of the Erie Railroad has made announcement of the sale. The big vessels are too large to go through the Welland Canal, so they will be cut in two and towed through in that manner. The cutting will be done in Buffalo, and the approximate cost of the cutting, towing and insurance will be $25,000. The boats will be used in the coastwise and trans-Atlantic trade.

Catalogues

Grinding and Polishing Machines made by J. G. Blount Co., Everett, Mass. A new catalogue, No. 17, describes at length a complete line of grinding and polishing machinery and speed lathes. Specifications giving the principal dimensions of each type of machine are included and numerous illustrations show the distinctive features embodied in the design of the various types. Copies may be had on application.

Pattern Manufacturers, Etc.

Morton Manufacturing Co.
Draw Cut Shapers, Special Draw Cut R.R Shapers, Special Locomotive Cylinder Planers.
Portable Planers, Stationary & Portable Key Way Cutters, Finished Machine Keys.
Office & Works, Muskegon Heights, U.S.A.

WOOD PATTERNS METAL
"GUELPH" PATTERN WORKS
135 Woolwich St. Guelph, Ont.

WOOD AND METAL PATTERNS
We also make Mounted Match Plates, Cast Iron Match Plates and Gates
Our staff of skilled workmen and our excellent facilities assure good quality and prompt delivery.
Write HAMILTON PATTERN & FOUNDRY CO. HAMILTON, ONT.
CASTINGS in BRASS ALUMINUM BRONZE and COPPER

CUNNINGHAM & SON
ST. CATHARINES, ONT.
MILL MACHINERY MARINE ENGINES
MACHINERY REPAIRS
SPECIAL MACHINERY MADE TO ORDER
CASTINGS OF EVERY DESCRIPTION

WIRE SPRINGS OF ALL KINDS
Machine Springs Valve Springs, Automobile Cushion Springs etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.
JAMES STEELE, LIMITED
GUELPH, ONTARIO

Let us quote you prices
TORONTO PATTERN
ACCURACY
WORKS
65 Jarvis St., Toronto, Ont.

IMMEDIATE DELIVERY

We always carry a large stock of machine tools for general manufacturing purposes, and solicit inquiries requiring prompt delivery.

We call attention to the following, on which we will quote attractive prices. All in thoroughly first-class condition:

Three 36″ Fellows Gear Shapers.
Two 36″ Brown & Sharpe turret head vertical boring mills.
One 30″ throat Putnam heavy punch and shear, capacity 1″ hole in 1″ plate.
One 72″ King vertical boring mill with two heads.
One 48″ Bement car wheel borer with crane.
One 38″ Baush vertical boring mill, two heads.
One 39″ Niles vertical boring mill, two heads.
Two 36″ Snyder upright drills, power feed, etc.
Two 5′ Bickford radial drills.

Girard Machine and Tool Co.

491-493 N. Third Street, Philadelphia, Pa.

We are buyers of:

LATHES and HYDRAULIC PRESSES

Lathes (new)—Length of bed, minimum, 3′-3″.
Distance between centres, minimum, 10″.

Hydraulic Presses (new)—

800 m m (32″) stroke.
400 tons pressure (short tons).
2,000 lbs. per square inch water pressure.

As well as all kinds of machine tools which can be delivered quickly. Send us descriptive catalogues, blue prints, prices and time required for delivery, etc.

Cable us if you have any machines to dispose of at once.

Etablissement Astra, 182 Rue Lafayette, Paris

THIS POSITION IS VACANT

If you will take it for one year it will only cost you
$2.25 Per Insertion.
Write for rate card and full particulars to
CANADIAN MACHINERY & MANUFACTURING NEWS
143 University Avenue, Toronto

Marine Engines.—Catalogue No. 11, issued by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, New York City, describes the Seabury marine engines for commercial and pleasure craft. A description covering the design of this type of engine is given accompanied by a number of illustrations. A list of the various sizes is included giving the principal dimensions for various horse powers.

Centrifugal Pumps is the title of a 64-page bulletin just issued by the Terry Steam Turbine Co., Hartford, Conn., giving details and data on various turbo-pump applications. The principles of operation and construction of the centrifugal pump are clearly explained, as are the details of the steam turbines which have been successfully used during the past ten years for driving them. This booklet should be in the hands of those who are interested in any kind of a pumping problem. Copies may be obtained on application.

Steel Poles for telephone, telegraph, trolley and transmission lines, etc., is the subject matter of a new catalogue issued by the Carbo Steel Post Co., Chicago, Ill. The "Carbo" steel pole is featured and the principles involved in their design, adaptability, durability and construction. A detailed comparison is made between "Carbo" steel and wooden poles for transmission lines as regards cost of installing, length of service, etc.

Steam Traps.—The Morehead Mfg. Co., Detroit, Mich., have issued catalogue No. 11, dealing with the "Morehead" tilting steam traps and comprising a description of the Morehead "Back to Boiler System" of steam drainage and boiler feeding. The catalogue contains 64 pages and the matter is well arranged. The construction and operation of the various types of steam traps are fully described and illustrated and their principal features dealt with at length. Numerous illustrations are given of plants with the traps installed as part of the "Morehead" system, and showing the wide and varied application of these traps. The illustrations are accompanied by brief descriptions stating the type of trap installed and the kind of plant.

Wagon and Truck Loaders The Link-Belt Co., Chicago, Ill., are distributing their new portable wagon loader catalogue No. 210, which describes the machine claimed to load a wagon or truck with material carried on the ground at the rate of one ton per minute. Specifications and price lists are given for each type of machine and numerous illustrations show the wide range of work and various materials these loaders are capable of handling. A number of tes-

timonials and partial list of users are also included.

Slotting Machines.—The Newton Machine Tool Works, Philadelphia, Pa., present their new catalogue, No. 49, dealing with a complete line of standard and special slotters. Specifications giving the principal dimensions of each type are included, accompanied by illustrations. These latter also show machines driven by belt, the pneumatic clutch and reversible motor, in addition to the crank and screw driven machines. A further series of illustrations in the form of an insert show many designs of milling, boring, drilling, and cold saw cutting-off machines.

Steel Split Pulleys.—An attractive catalogue issued by the Keystone Pulley Co., Oneida, N.Y., contains particulars covering the "Keystone" steel split pulleys. The principal features incorporated in the design of these pulleys are described in detail and the illustrations give a good general idea of their construction. Price lists and shipping weights are given for each size and the illustrations show the various types of pulley and also interior views of the factory where they are made. The catalogue concludes with some useful rules for finding pulley diameters and speeds.

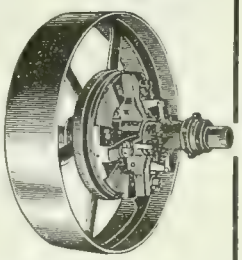
Lagonda Vibrator Cleaners is the name of the latest catalogue of the Lagonda Manufacturing Co., Springfield, Ohio. This bulletin discusses formation and removal of scale from fire tube boilers, and describes and illustrates the new Lagonda Vibrator Cleaner, which is proving most highly effective in removing scale from fire tubes. The cleaner also loosens the soot on the interior of the tubes and it is blown out by the air or steam exhausting from the front end of the turbine. The turbine used in this cleaner is the Lagonda high efficiency, high power, air or steam driven machine. Copy of this bulletin will be sent to anyone on request.

Centrifugal Blowers and Compressors for all pressures from 5 ins. of water, as in mechanical draft service, up to 125 lbs. per square inch, as for compressed air distribution in mines, machine shops, ship yards, etc., are described in a 64-page book issued by the DeLaval Steam Turbine Co., of Trenton, N.J. The development of the high efficiency, high-speed centrifugal blower or compressor has been conditional upon improvements in materials, construction, shop practice and design such as are employed in the building of high-grade steam turbines. By careful calculation of stresses, and by the use of good materials and workmanship, it is possible to run blower and compressor wheels safely and satisfactorily at peripheral velocities of 450 to 600 ft. per second, which makes it pos-

MAPLE LEAF
STITCHED COTTON DUCK
BELTING
DOMINION BELTING CO LTD
HAMILTON CANADA

THE FRISBIE CLUTCH
LASTS LONGER

FRISBIE CLUTCHES GIVE ONE ABSOLUTE CONTROL OF A MACHINE AND PREVENT MANY ACCIDENTS. They make it possible to shut down one machine without affecting any other machine in the shop. YOU GET ALL THE POWER YOU PAY FOR AND YOU DON'T PAY FOR ANY YOU DON'T NEED. FRICTION FACES WILL NOT WEAR QUICKLY. It will pay you to get full details.



The Eastern Machinery Co.
New Haven, Conn., U.S.A.

Oil Tempered Steel Springs

—for every purpose and the best for each use.

Special styles of all kinds to order.

THE CLEVELAND WIRE SPRING CO.
Cleveland, Ohio.

The "Delta" makes the stock fly

FILES OF QUALITY

We have made exhaustive working tests of the Delta File against other files and it has shown increased output in given time and much greater durability of cutting edge.

The Delta is the **only** line of files from 3 to 24 inches—made absolutely of crucible steel.

Make the acquaintance of the Delta service now through a trial order. You have nothing to lose, for your money goes back promptly if not convinced that Delta Files are all that is claimed for them.

Write your dealer.

TRADE MARK
DELTA

DELTA FILE WORKS
PHILADELPHIA, PA.

CANADIAN AGENTS:
H. S. Howland, Sons & Co., Toronto;
Starke, Seybold, Montreal;
Wm. Stairs, Son & Morrow, Halifax;
Merrick-Anderson Co., Winnipeg
All Leading Jobbers

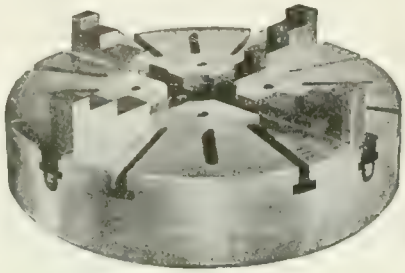
We Know

you are anxious to buy

Canadian Made

goods.

The Imperial



Chuck

is manufactured by

Ker & Goodwin

Brantford, Canada

THE OWEN SOUND IRON WORKS CO.

Owen Sound, Ont.

Engineers

Boiler-makers

Founders

Machinists

Tank Work,

Smoke Stacks,

Grey Iron and Brass Castings,

Special Machinery Made to Order.

BOLTS

Our large stock of Machine Bolts, Rivets and Washers assures quickly filled orders and prompt shipment. One quality only—The Best. Send a trial order.

LONDON BOLT & HINGE WORKS

London Ontario

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

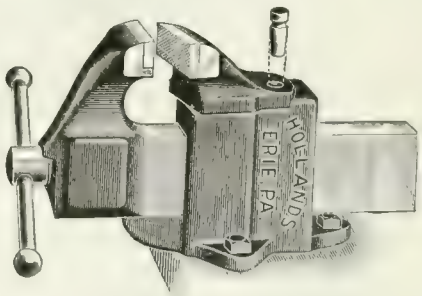
We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS

120 Adelaide St. W., Toronto

VISE EFFICIENCY



Hollands Vises meet the requirements of mechanics who demand the highest efficiency, combined with maximum strength and durability.

It is not economy to buy cheap vises.

Our Catalog No. 22 will explain why many of the leading industrial shops have used our vises for over a quarter of a century.

Hollands Mfg. Co.

Established 1887

Erie, Pa.

sible to develop as much as 3 or 4 lbs. per square inch pressure in a single-stage blower. In the present publication numerous charts are given showing curves for the isothermal, adiabatic and actual compression of air, also the theoretical power required to compress air and characteristic curves of single—and multi-stage blowers and compressors. The influence of impeller design upon the form of the characteristic is discussed at some length. Particulars are given concerning the application of centrifugal blowers and compressors to forced draft, coal gas manufacture, coke oven plants and water-gas plants, sugar factories, cupola and blast furnace work, Bessemer converters, supplying compressed air in mines, ship yards, etc. The illustrations present numerous examples of blowers and compressors directly connected to steam turbines and to electric motors.

Book Reviews

A Study of Boiler Losses, by A. P. Kratz, has been issued as Bulletin No. 78 of the Engineering Experiment Station of the University of Illinois. This bulletin presents a critical analysis of the data obtained from a series of twenty-five trials made on a 500 horse-power Babcock and Wilcox boiler located in the heating plant of the University. The boiler was operated under varying conditions of load and depth of fuel bed. Curves are presented and conclusions are drawn regarding the conditions necessary in order to secure the best continuous operation. In these tests, gas samples were taken both at the bridge and in the breeching, and a determination of the loss due to air leaking through the setting was made. A curve is also given which shows the percentage of excess air represented by the different amounts of CO_2 appearing in the gas. The heat balance has been subdivided so as to isolate and determine the amount of the several losses chargeable to the boiler, furnace and setting. Complete forms for calculating a series of boiler trials are given, and the corrections for differences in pressure and water levels at the beginning and end of a test are discussed. Tests were also made using some samples of coal which had been exposed to the weather for about six years. An interesting fact brought out was that no difficulty was experienced in burning the weathered coal. It had deteriorated until it was of about the same composition and grade as the fresh Vermilion County screenings, and its steaming qualities compared very favorably with those of the latter. Copies of Bulletin No. 78 may be obtained gratis upon application to C. R. Richards, Acting Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

CUT GEARS

Theoretically Correct

RAWHIDE OR METAL

PROMPT SERVICE

ROBERT GARDNER & SON

LIMITED

52 NAZARETH ST., MONTREAL, P. Q.

Made in CANADA

SOLD ON MERIT

"HOYT FROST KING"

WILL GIVE YOU THE UTMOST IN BABBITT SERVICE.

It has been on the market for years and has given distinctive service everywhere. **May we send you a 25-lb. box for trial?**

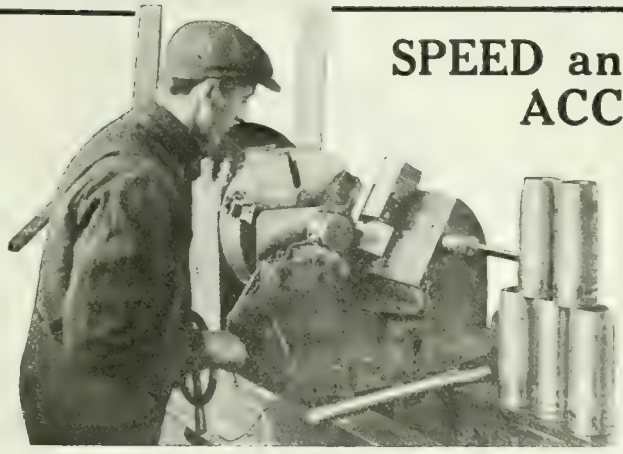
We have a complete plant for manufacturing **SHRAPNEL BULLETS.**

PRICES RIGHT SERVICE PROMPT

HOYT METAL COMPANY

Factory and Offices, EASTERN AVE. and LEWIS ST., TORONTO, ONTARIO

New York, N.Y.; London, Eng.; St. Louis, Mo.



Band Turning Lathe.

SPEED and ACCURACY

The two most important factors in the machining of shrapnel and 4.5 shells, speed and accuracy, can be achieved when turning copper bands by using this machine.

The cut at the left shows an operator turning copper bands on our machine. **His daily output averages 40 to 45 shells per hour.**

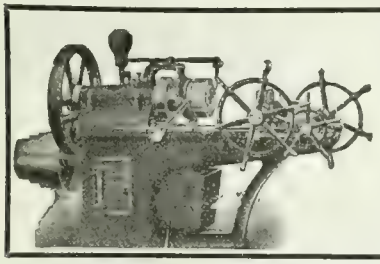
This lathe was designed and built by us especially for this work. It is of sufficiently heavy construction to enable it to stand up under the strenuous work demanded of shell-making machinery.

Most of the largest manufacturers have found it profitable to adopt it. Let us tell you why. We invite your inquiry.

The Jenckes Machine Co., Limited

Sherbrooke, Quebec

Branches at Toronto, Ontario, 728 Traders Bank Bldg.
Montreal, Que., 303 E. T. Bank Building.
St. Catharines, Ont.; Cobalt, Ont.; Vancouver, B.C.; Nelson, B.C.



BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

CANADIAN AGENT:
H. W. PETRIE, Ltd.
TORONTO, ONT.
MONTREAL, QUE.
VANCOUVER, B.C.

High-Grade Malleable Castings

OF ALL SIZES AND KINDS

Galt Malleable Iron Co., Limited - - Galt, Ontario

HINTS TO BUYERS

Genuine Armstrong Stocks and Dies

Hinged Pipe Vises.
Pipe Cutters. Steam and Gas Fitters' Tools.
Pipe Machines for Threading Pipe.
Either Hand or Power.

Manufactured by

THE ARMSTRONG M'F'G CO.
328 KNOWLTON ST. BRIDGEPORT, CONN.
NEW YORK, 248 CANAL ST.

A BALATA BELTING

Which We Guarantee Second To None And Entirely Satisfactory

Try One And Be Convinced

J.C.McLAREN BELTING CO.
Limited
MONTREAL TORONTO WINNIPEG

TRADE MARK
THE J.C.McLAREN BELTING Co LIMITED

WELLAND MACHINE AND FOUNDRIES
WELLAND - LIMITED - ONTARIO

We specialize in Dies and Chills for forging Shells.

All kinds of Grey Iron and Semi-Steel Castings guaranteed clean and true to pattern.

HAND HOISTS, STRUCTURAL CASTINGS, ETC.

Steam Hoisting ENGINES

Special MACHINERY

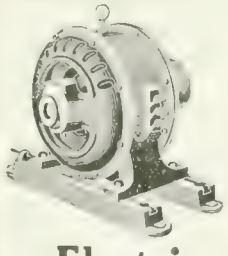
Railway and Highway Bridges

Locomotive Turn Tables

The CANADIAN BRIDGE CO. Limited Walkerville Ont.

Structural Steel and Iron Work

Steel Buildings Roof Trusses



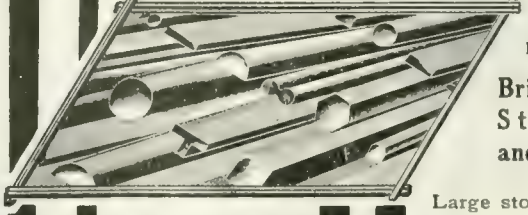
Do You Need Motors?

If so, write

Toronto & Hamilton Electric Company, Limited
HAMILTON, ONT.

Who make Motors for Hydro and all other Circuits. Dynamos for Light and Power. Storage Batteries.

UNION DRAWN STEEL CO. LTD.



HAMILTON, ONTARIO

Manufacturers of Bright Finished Steel Shafting and Shapes.

Large stock of all sizes.

Send for Price List

The advertiser would like to know where you saw his advertisement—tell him.

PRESSES FOR SHRAPNEL

HYDRAULIC PRESSES

For Nosing and Banding

Hydraulic Presses for all purposes. Hydraulic Pumps and Accumulators.

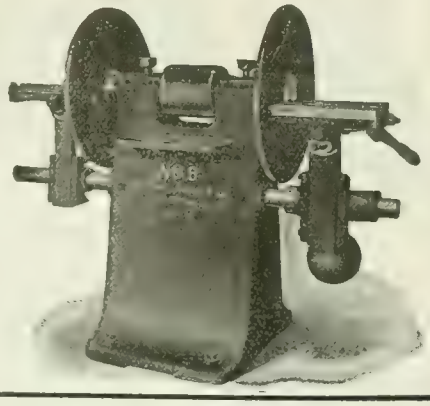
FORGING PRESSES.

Drop a card for full details.

William R. Perrin
Limited
TORONTO

Gardner Disc Grinder

Gardner Disc Grinders are made in all sizes, types and combinations. We can successfully meet any disc grinding problem in existence. Largest builders of Disc Grinding machinery in the world.



Gardner Machine Co.
The Disc Grinding Authorities
BELOIT, WIS.
Canadian Agents: A. R. Williams Machinery Co.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE
Canadian Drawn Steel Co.
Limited
Hamilton Canada

The Garvin Machine Co.

Manufacturers of

Milling Machines; Profiling Machines; Cam Cutting Machines; Screw Machines; Monitor Lathes; Die Slotting Machines; Screw Slotters; Tapping Machines; Duplex Horizontal Drills; Gang Drill Presses; Four-Head Right-Angle Drills; Wrenchless Chucks; Spring Coilers; Cutter Grinding Machines; Surface Grinders; Hole Grinders; Hand Lathes and Special Machinery.

We Want All To Have Our Catalog—Send For It To-day.

Spring and Varick Streets, NEW YORK CITY

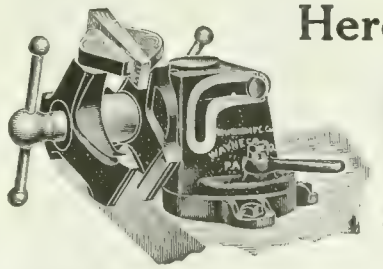
Who's Next on the List?

Allen Safety Set Screws Prevent Accidents.

The projecting heads of set screws claim many thousands of victims yearly which Allen Safety Set Screws will prevent. This Screw is different from all other hollow set screws.

Write for Price List No. 3. Free samples for testing

The Allen Manufacturing Co., Hartford, Conn., U.S.A.
England, 173 Princess St., Manchester.



Here's a Vise

that will hold work, but The Emmert Universal will hold work in any possible position to suit the user. Has seven pairs of jaws and will do all the "jawing" necessary, therefore saves the workman's "jaws." Fifty thousand of them are doing it everywhere. Why not used on your benches? Try one and be convinced.

WRITE FOR NEW CATALOG.

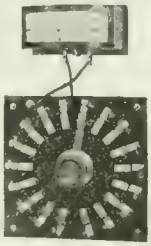
EMMERT MANUFACTURING CO.
Waynesboro, Pa., U.S.A.

Canadian Representatives:
The Canadian Fairbanks-Morse Company, Limited
Montreal, Toronto, Winnipeg, Vancouver, St. John, Calgary, Ottawa

If YOU are Making SHRAPNEL

You need a

TWINKO



Indicating or Recording PYROMETER

It will insure the metal being treated at the right temperature. Don't take any risks.

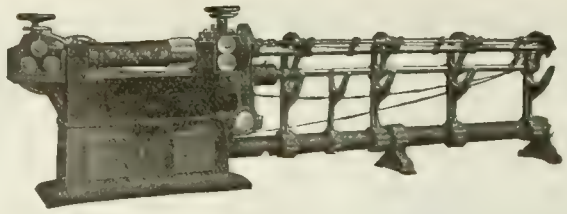
Write for Bulletins Nos. 6 and 7.

THWING INSTRUMENT COMPANY
441 N. 5th St., Philadelphia, Pa.
Canadian Representative:
JAS. DE VON, 227 Davenport Road, Toronto, Ont.

THIS SPACE
$3.00 PER ISSUE
On Yearly Order

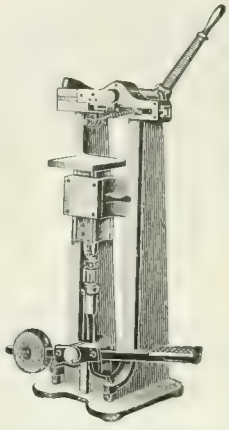
Send us a trial order and let us show you that the best pump is ultimately the cheapest.

The Smart-Turner Machine Co., Ltd.
HAMILTON, CANADA

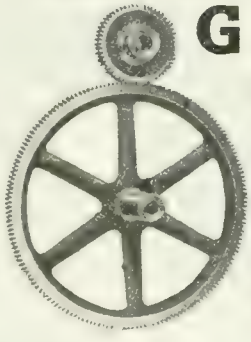


THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
May we send you catalogue C?
The F. B. SHUSTER COMPANY, New Haven, Conn.
Formerly John Adt & Son. Established 1866
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

HIGH-GRADE
Iron Working Machinery
Specially adapted for manufacturing
WAR AMMUNITION
DROP A CARD TO
Canada Machinery Agency
298 St. James Street, Montreal

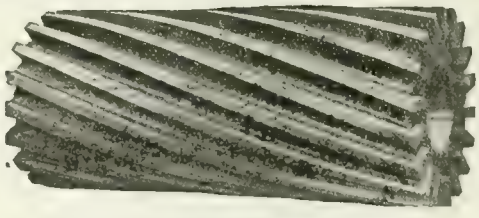


DWIGHT SLATE MARKING MACHINE TRADE MARK
For Marking Shrapnel Shells
or they will mark any article, either round or flat. Power or Hand Machines recommended.
Steel Stamp and Die Cutting by expert engravers.
Send for Catalogue.
Noble & Westbrook Mfg. Co.
Hartford, Conn., U. S. A.



GEAR
Wheels
Cutting
of every description.
Matchless Rawhide Pinions in 24 hours.
PHILADELPHIA GEAR WORKS
Vine Street, Philadelphia, Pa.

Taylor-Newbold Milling Cutters



Inserted Helical Blades of High-Speed Steel, with constant Rake Angle, insures higher speeds and heavier cuts.
MAY WE SEND BULLETIN R-P ?
THE TABOR MANUFACTURING COMPANY
PHILADELPHIA, PA., U.S.A.

SKINNER DRILL PRESS VISE

A substantial, durable tool which will pay for itself in short order in any machine shop. Three sizes to accommodate a wide range of work. Try one and you'll buy more. New complete chuck catalog on request.
THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN.

IT IS IMPORTANT!
If you have something to dispose of in goods or service that as many buyers as possible get to know you and your product. This can be accomplished through
Canadian Machinery
143 University Avenue, Toronto

THE DUPONT

Patent

Power Hammer

BEST FOR Durability, Economy of Power, Simplicity of Adjustment.

Seven Sizes
from 35 to 300 lbs.

Only High-Class Material Used and Satisfaction Guaranteed.

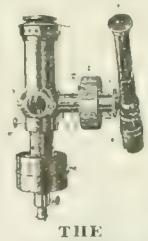
ASK FOR CATALOGUE.
SENT FREE

The PLESSISVILLE FOUNDRY

Plessisville, Que

Ontario and Western Agents :
The General Supply Co. of Canada Ltd.
Ottawa Toronto Winnipeg

For Hardness Testing

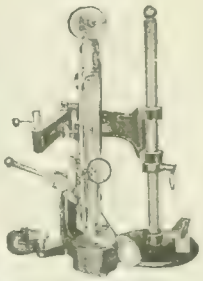


in shop and laboratory use the

Standard Scleroscope

Universally adopted, direct reading inexpensive and the only instrument that agrees with others of its kind in all parts of the World, thus solving problems of ordering materials to specification.

BOOKLET FREE.



THE SCLEROSCOPE (Set)

Heat Indication

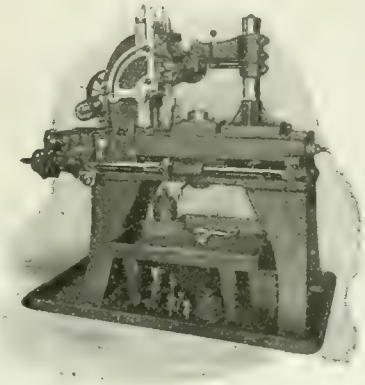
THE PYROSCOPE

is fast becoming the correct thing. The PYROSCOPE has solved the problem

Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.



The Whiton

AUTOMATIC

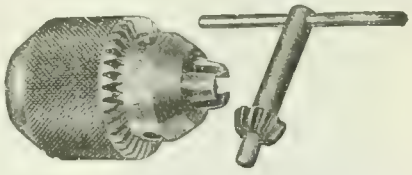
Gear Cutting Machine

Do you want Catalog?

The D. E. Whiton Machine Co.

NEW LONDON, - CONN.

INCREASED SALES AND UNSOLICITED REPEAT ORDERS



are, we believe, acknowledgments of the satisfactory results obtained from former purchases.

During the past twelve years the sale of the JACOBS IMPROVED DRILL CHUCK has constantly increased. During June, 1915, without solicitation, we sold more JACOBS IMPROVED DRILL CHUCKS than during any other month of our phenomenally successful career.

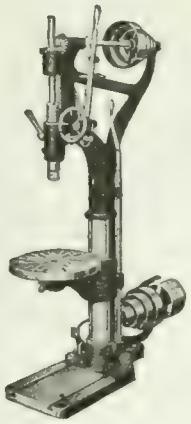
This fact is significant and may be accounted for only because of the satisfactory service the JACOBS IMPROVED DRILL CHUCKS have rendered.

Our illustrated catalogue C sent upon request.

The Jacobs Manufacturing Co., Hartford, Conn., U.S.A.

The BARNES DRILLS

TRADE MARK



Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

SEND FOR CATALOG.

W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO
Toronto, Winnipeg, Vancouver, and St. John, N.B.
WILLIAMS & WILSON, Montreal

PRESSES—ALL TYPES

Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines, Grinders.
Special Machines.

Baird Machine Co., Bridgeport, Conn.

Detective and Stop Watch Combined.

"We have a counter on every one of our presses, even the foot presses." This from a satisfied user of our counters. If you use presses our counters would save you money. **Ask for catalog 25.**

The C. J. ROOT CO., 125 Bridge Street, Bristol, Conn.

NORTON JACKS

For all kinds of heavy lifting

Send for complete catalogue showing 50 styles 10 to 100 tons capacity.

Made only by

A. O. NORTON, LIMITED

Coaticook, Prov. Quebec - - Canada

PULLEYS

ALL WOOD—COMBINATION—IRON—STEEL

Every pulley fully guaranteed.

Write for interesting printed matter.

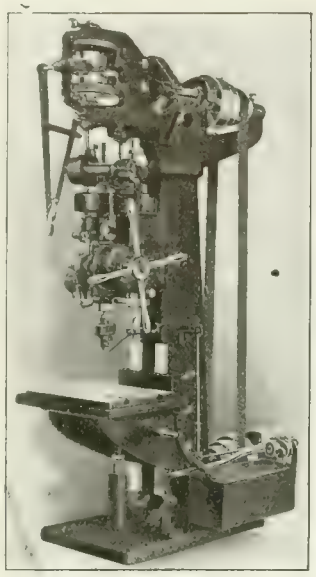
The Positive Clutch & Pulley Works, Ltd.

Montreal Factory: Aurora, Ont. Toronto

TURNER TURRET

Affords a very rapid, economical and accurate method for drilling, reaming, counterboring, threading, undercutting, etc., for Fuse Timing and Detonator Parts for

Shrapnel and Lyddite Shells—



4, 5, 6 *OPERATIONS AT ONE SETTING.* Tools revolve. Work set. Turret automatically indexes successive tools to precisely the same working centre. Only working spindle rotates.

Trunnion chucks permit operations on several sides at ONE CHUCKING, NO STOP FOR CHUCKING, NO SHIFTING OF WORK, NO FATIGUE FROM INDEXING TURRET.

Less than one second between successive tools.

Turret is suspended within rigid, accurate case, and indexes automatically.

Detent located in case and fits adjustable sockets in turret.

Very wide range of work. Hand and power feed.

SEND US YOUR BLUE-PRINTS FOR ESTIMATES.

Ask for Catalog.

Turner Machine Company, Danbury, Conn., U.S.A.

Keen Kutter Cutting Compound

is a most efficient lubricant for use on lathes, for drilling and cutting. It protects the dies, is very cooling, easily mixed, will not separate, does not injure the hands, and is the best article on the market for the work. Being manufactured in Canada, we are thus able to save the user 20% in price; the quality we guarantee.

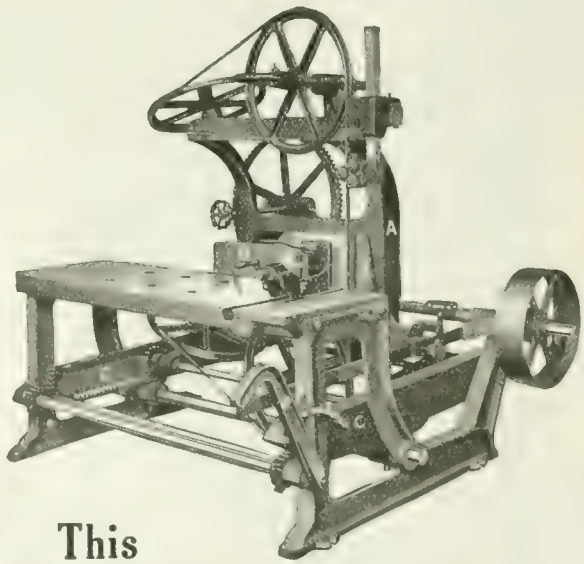
QUENCHING OIL

is an oil specially prepared by us for the dipping of shells.

Write us to-day if you are in the market and we will be pleased to submit quotations.

The Commercial Oil Company Limited

Hamilton, Ontario



This Shinn Metal Cutting Band Saw

is specially adapted to requirements of

Canadian Shrapnel Shell Manufacturers

Will cut all kinds of metals at any angle. Its rapidity and accuracy will meet your every need.

AS TO PRICE you cannot get a better saw anywhere for the money:—

No. 1 Capacity 12" by 11" $175.00
No. 2 Capacity 12" by 17" $200.00

Canadian agents wanted.

IMMEDIATE SHIPMENT write for particulars to

M. E. SHINN & COMPANY

1846 West Lake Street CHICAGO

CANADIAN MACHINERY BUYERS' DIRECTORY

TO OUR READERS—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.

TO NON-ADVERTISERS—A rate of $5 per line a year is charged non-advertisers.

Abrasive Materials.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
Stevens, F. B., Detroit, Mich.

Acetylene.
L'Air Liquide Society, Montreal, Toronto.

Acetylene Generators.
L'Air Liquide Society, Montreal, Toronto.

Accumulators, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Wks., Chicago.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.
R. D. Wood Co., Philadelphia, Pa.

Air Compressors.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Smart-Turner Machine Co., Hamilton, Ont.

Air Hoists.
Q. M. S. Company, Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Air Hose.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Can. Ingersoll-Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

Air Receivers.
Can. Ingersoll-Rand Co., Montreal.

Air Washers.
Buffalo Forge Co., Buffalo, N.Y.
Can. Sirocco Co., Ltd., Windsor, Ont.

Ammeters.
Brown Inst. Co., Philadelphia, Pa.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Aluminum.
M. & L. Samuel, Benjamin & Co., Toronto.
Tallman Brass & Metal Co., Hamilton.

Alloys, Steel.
H. A. Drury Co., Ltd., Montreal.
Vanadium Alloys Steel Co., Pittsburg, Pa.

Architectural Engineers.
Hooper-Falkenau Eng. Co., New York.

Arbors.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Plessisville Foundry, Plessisville, Que.
Pratt & Whitney Co., Dundas, Ont.

Assembling Stands.
Skinner Chuck Co., New Britain, Conn.

Automatic Chucks.
Garvin Machine Co., New York.

Asbestos Packing.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Autogenous Welding and Cutting Plants.
L'Air Liquide Society, Montreal, Toronto.

Automatic Index Milling Machines.
Garvin Machine Co., New York.
National Machinery and Supply Co., Hamilton.

Automatic Lowering Devices.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.

Automatic Machinery.
Baird Machine Co., Bridgeport, Conn.
A. R. Williams Machy. Co., Toronto.
Gardner, Robt. & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
Pratt & Whitney Co., Dundas, Ont.
Owen Sound Iron Works Co., Owen Sound.
A. O. Walworth & Co., Chicago, Ill.
Windsor Machine Co., Windsor, Vt.

Automatic Multiple Spindle.
Windsor Machine Co., Windsor, Vt.

Automatic Wood Screw Machines.
Asa F. Cook Co.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbitt Metal.
Can. Fairbanks-Morse Co., Montreal.
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

Baking Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.

Ball Bearings.
Can. Fairbanks-Morse Co., Montreal.
Chapman Double Ball Bearing Company, Toronto.

Ball Burnishing Machines.
Baird Machine Co., Bridgeport, Conn.

Banding Machines, Hydraulic.
West Tire Setter Co., Rochester, N.Y.

Barrels, Steel Shop.
Baird Machine Co., Bridgeport, Conn.
Canadian Steel Products Company, Montreal.
Cleveland Wire Spring Co., Cleveland.

Bars, Boring.
Charles F. Elmes Eng. Works, Chicago
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound.

Bar Benders and Straight Edges.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Bar Benders, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Belt Benches.
Tabor Mfg. Co., Philadelphia, Pa.

Belt Dressing and Cement.
Commercial Oil Co., Hamilton, Ont.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Montreal.

Belt Lacing, Leather.
Graton & Knight Mfg. Co., Montreal.

Belting, Chain.
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.
Jones & Glassco, Montreal.

Belting, Cotton.
Dominion Belting Co., Hamilton.

Belting, Leather.
Can. Fairbanks-Morse Co., Montreal.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Girard Machine & Tool Co., Philadelphia, Pa.
Graton & Knight Mfg. Co., Montreal.
D. K. McLaren, Ltd., Montreal.

Belting, Stitched Cotton Duck.
Dominion Belting Co., Hamilton, Ont.

Belting, Rubber.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Benders, Angle and Tee Iron.
Can. Buffalo Forge Co., Montreal.
Watson-Stillman Co., Aldene, N.J.

Bending Machinery.
John Bertram & Sons Co., Dundas.
Bertrams, Limited, Edinburgh, Scotland.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound.
Toledo Machine & Tool Co., Toledo, O.
Steel Bending Brake Works, Chatham, Ont.
Watson-Stillman Co., Aldene, N.J.

Bins, Steel.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Bit Brace Tools.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Blast Gauges, Cupola.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Blocks, Lifting.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.

Blowers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Girard Machine & Tool Co., Philadelphia, Pa.
Sheldons, Ltd., Galt, Ont.
Southwark Foundry & Machine Co., Philadelphia.

Blow Pipes and Regulators.
L'Air Liquide Society, Montreal, Toronto.

Blue Print Machinery.
Revolute Machine Co., New York.

Bluing Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Boilers.
Can. Locomotive Co., Kingston, Ont.
National Machinery & Supply Co., Hamilton.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Polson Iron Works, Toronto.

Boiler Compounds.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Boiler Graphite.
Dixon Crucible Co., Jersey City, N.J.

Boiler Makers' Supplies.
Jno. F. Allen Co., New York.
Polson Iron Works, Toronto.

Bolt Cutters and Nut Tapers.
Wells Brothers Co., Greenfield, Mass.

Bolts.
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.

Bolt and Nut Machinery.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas, Ont.
Owen Sound Iron Works Co., Owen Sound.
Gardner, Robt., & Son, Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
National Machinery & Supply Co., Hamilton.
Wiley & Russell Co., Greenfield, Mass.

Books.
MacLean Publishing Co., Toronto.

Boring Machines, Upright and Horizontal.
John Bertram & Sons Co., Dundas.
Colburn Machine Tool Co., Franklin, Pa.
Detrick & Harvey Machine Co., Baltimore, Md.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
Newton Machine Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Stow Mfg. Co., Binghamton, N.Y.
A. O. Walworth & Co., Chicago, Ill.

Boring Machines, Pneumatic, Cylinder.
Baker Brothers, Toledo, O.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Newton Machine Tool Works, Philadelphia, Pa.
Stow Mfg. Co., Binghamton, N.Y.
A. O. Walworth & Co., Chicago, Ill.

Boring Machines (Railroading).
Newton Machine Tool Works, Philadelphia, Pa.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas.
Colburn Machine Tool Co., Franklin, Pa.
Detrick & Harvey Machine Co., Baltimore, Md.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
A. O. Walworth & Co., Chicago, Ill.

Box Puller.
Jardine, A. B., & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland.

Brakes.
Brown, Boggs & Co., Hamilton, Can.
Whiting Foundry Equipment Co., Harvey, Ill.

Brakes, Heavy Plate Bending and Cornice.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Brass Working Machinery.
A. R. Williams Machy. Co., Toronto.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.

Brick Cars.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Brick Dryers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Brick Machinery.
Eastern Machinery Co., New Haven.
Sheldons, Ltd., Galt, Ont.

Bridges, Railway and Highway.
Can. Bridge Co., Walkerville, Ont.

Bucket Elevators.
Pangborn Corporation, Hagerstown, Md.

Buckets, Clam Shell, Crab and Dump.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Buffing and Polishing Machinery.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
Gray Mfg. & Machine Co., Toronto.
New Britain Machine Co. New Britain, Conn.

Bulldozers.
John Bertram & Sons Co., Dundas.
Canada Mach. Corporation, Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
National Machinery & Supply Co., Hamilton, Ont.
Watson-Stillman Co., Aldene, N.J.

Burners, Enclosed Flame Gas.
Oven Equipment & Mfg. Co., New Haven, Conn.

Burners, Fuel, Oil and Natural Gas.
Whiting Foundry Equipment Co., Harvey, Ill.

Burring Reamers.
Wells Brothers Company, Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Butterises.
Wells Brothers Company, Greenfield, Mass.

Burrs, Iron and Copper.
Parmenter & Bulloch Co., Gananoque.

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
National Machinery & Supply Co., Hamilton, Ont.

Cars, Industrial.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Cunningham & Son, St. Catharines, Ont.
Owen Sound Iron Works Co., Ltd., Owen Sound, Ont.
St. Lawrence Foundry, Galt, Ont.
Tallman Brass & Metal Co., Hamilton

Castings, Air Furnaces.
Wm. Tod Company, Youngstown, O.

Castings, Brass.
Cunningham & Son, St. Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.
T. C. Lawrence Foundry, Galt, Ont.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Bronze.
Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Copper.
Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Gray Iron.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Castings of Ottawa, Ottawa, Ont.
Erie Foundry Co., Erie, Pa.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.

Castings, Steel Chrome and Manganese Steel.
Electric Steel & Metals Co., Welland.
Hull Iron & Steel Foundries, Ltd., Hull Quebec.
Wm. Tod Company, Youngstown, O.

Castings, Malleable.
Galt Malleable Iron Co., Galt.

Castings, Nickel Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.

Cement, Disc Wheel.
Gardner Machine Co., Beloit, Wis.

Cement, Iron.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Shelton Metallic Filler Co., Derby, O.

Cement Machinery.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.

Centre Reamers.
Wells Brothers Co., Greenfield, Mass.

Centering Machines.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Centrifugal Pumps.
Can. Buffalo Forge Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Chain Blocks.
Can. Fairbanks-Morse Co., Montreal.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
National Machinery & Supply Co., Hamilton.

Chain Slings.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.

Chain Clutches.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.

Chains, Silent and Transmission.
Jones & Glassco, Montreal.
John Millen & Son, Montreal.
Morse Chain Co., Ithaca, N.Y.
Plessisville Foundry, Plessisville, Que.

Chemists.
Toronto Testing Laboratory, Ltd., Toronto.

Chucks, Aero, Automatic.
Garvin Machine Co., New York.

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont.
Buffalo Forge Co., Buffalo, N.Y
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Cushman Chuck Co., Hartford, Conn.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Wells Brothers Co., Greenfield, Mass.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
National Machinery & Supply Co., Hamilton.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Chucks, Drill, Automatic and Keyless.
Buffalo Forge Co., Buffalo, N.Y.

Chucks, Ring Wheel.
Gardner Machine Co., Beloit, Wis.

Chucking Machines.
W. P. Davis Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

Cinder Mills.
W. W. Sly Mfg. Co., Cleveland, O.

Cleaning Mills.
W. W. Sly Mfg. Co., Cleveland, O.

Cloth and Wool Dryers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Sheldons, Limited, Galt.

Clutches.
Eastern Machinery Co., New Haven, Conn.
Jones & Glassco, Montreal.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Ltd., Toronto.

Coal Handling Machinery.
Whiting Foundry Equipment Co., Harvey, Ill.

Coke and Coal.
Hanna & Co., M. A., Cleveland, O.

Collectors, Pneumatic.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt.

Compressors, Air.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.
National Machinery & Supply Co., Hamilton.
The Smart-Turner Machine Co., Hamilton.

Concentrating Plant.
Gardner, Robt., & Son, Montreal.

Concrete Mixers.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.

Concrete Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton.

Condensers.
Can. Buffalo Forge Co., Montreal.
The Smart-Turner Machine Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Consulting Engineers.
Hooper-Falkenau Eng. Co., New York.

Controllers and Starters, Electric Motor.
A. R. Williams Machy. Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Conveyors, Belt and Screw.
Pangborn Corporation, Hagerstown, Ind.

Conveyor Machinery.
Can. Fairbanks-Morse Co., Montreal.
Can. Mathews Gravity Carrier Co., Toronto
National Machinery & Supply Co., Hamilton, Ont.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.

Coping Machines.
Can. Buffalo Forge Co., Montreal.
John Bertram & Sons Co., Dundas.
National Machinery & Supply Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Cornice Brakes.
Brown Boggs Co., Ltd., Hamilton, Canada.
Steel Bending Brake Wks., Chatham.

Counting Machines.
National Scale Co., Chicopee Falls, Mass.
C. J. Root Co., Bristol, Conn.

Counterbores and Countersinks.
Cleveland Twist Drill Co., Cleveland.
Detroit Twist Drill Co., Detroit, Mich.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Countershafts.
Baird Machine Co., Bridgeport, Conn.
Standard Pressed Steel Co., Philadelphia, Pa.
Wells Bros. Co., Greenfield, Mass.

Country House Lighting and Cooking.
Can. Blaugas Co., Montreal.

Couplings.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Eastern Machinery Co., New Haven, Conn.
Gardner, Robt., & Son, Montreal.
Owen Sound Iron Works Co., Owen Sound, Ont.

Couplings, Air Hose.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Crabs, Travelling.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Owen Sound Iron Works Co., Owen Sound.

Cranes, Locomotive.
Northern Crane Works, Walkerville.

Cranes, Gantry.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Goliath.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Watson-Stillman Co., Aldene, N.J.

Cranes, Pneumatic.
Northern Crane Works, Walkerville.
Q. M. S. Co., Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Post Jib.
Northern Crane Works, Walkerville.
Q. M. S. Co., Chicago, Ill.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Portable.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Swing Jib.
Northern Crane Works, Walkerville.
Q. M. S. Co., Chicago, Ill.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Transfer.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wall.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Travelling Electric and Hand Power.
Dominion Bridge Co., Montreal.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Crane, Chain.
Northern Crane Works, Walkerville.

Cranes, All Kinds.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound, Ont.
Southwark Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.
Niles-Bement-Pond Co., New York.

Crimps, Leather.
Graton & Knight Mfg. Co., Montreal.

Cupolas.
Can. Buffalo Forge Co., Montreal.
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola and Blast Gate Blowers.
Can. Sirocco Co., Ltd., Windsor, Ont.

Cupola Blast Gauges & Blowers.
Sheldons, Ltd., Galt, Ont.

Cutters, Angle, Tee Iron and Bar.
Can. Buffalo Forge Co., Montreal.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Cutters, Pipe.
Can. Fairbanks-Morse Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co., Roxbury, Mass.

Cutting Compound & Cutting Oil.
Can. Economic Lubricant Co., Montreal.
Commercial Oil Co., Hamilton, Ont
Crescent Oil Co., New York.

Cutter Grinders and Attachments
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.

Cutters, Milling.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Detroit Twist Drill Co., Detroit, Mich.
Garvin Machine Co., New York.
Morse Twist Drill and Machine Co., New Bedford.
Tabor Mfg. Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
W. P. Davis Machine Co., Rochester, N.Y.
Earle Gear & Machine Co., Philadelphia, Pa.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Geo. Gorton Machine Co., Racine, Wis.
Newton Machine Tool Works, Philadelphia, Pa.
Nutter & Barnes Co., Hinsdale, N.H.
Pratt & Whitney Co., Dundas, Ont.
Q. M. S. Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Can. Fairbanks-Morse Co., Montreal.

Derricks.
Dominion Bridge Co., Montreal.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Designers, Special Machinery.
Baird Machine Co., Bridgeport, Conn.
Hooper-Falkenau Eng. Co., New York.

Dies and Die Stocks.
Armstrong Mfg. Co., Bridgeport, Conn.
Banfield, W. H. & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Gardner, Robt., & Son, Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wiley & Russell, Greenfield, Mass.

Dies for Bit Brace Use.
Wells Brothers Co., Greenfield, Mass.

Die Castings.
Tallman Brass & Metal Co., Hamilton

Die Sinkers.
Garvin Machine Co., New York.

Dies for Machines.
Wells Brothers Co., Greenfield, Mass.

Die Sinking Presses, Hydraulic
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Dies, Self-opening.
Duncan Electrical Co., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit

When you begin to buy belting on the basis of **service** instead of price or habit, you are on the straight road to belting economy.

LEVIATHAN AND ANACONDA ELEVATING TRANSMITTING CONVEYING BELTING

That's the way to buy

LEVIATHAN and ANACONDA BELTING

You can depend on them for more certain service than any other belting you have ever used—rubber, balata, fabric or leather.

Main Belting Co. of Canada
Limited
10½ St. Peter St., Montreal

WATCH FOR OUR MESSAGE IN NEXT WEEK'S ISSUE.

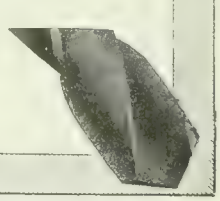
Cleveland Twist Drills

Big in Value Because of the Holes They Make

Holes count—not drills. That drill is most valuable that produces the greatest number of holes. Cleveland Twist Drills stand out as Hole makers.

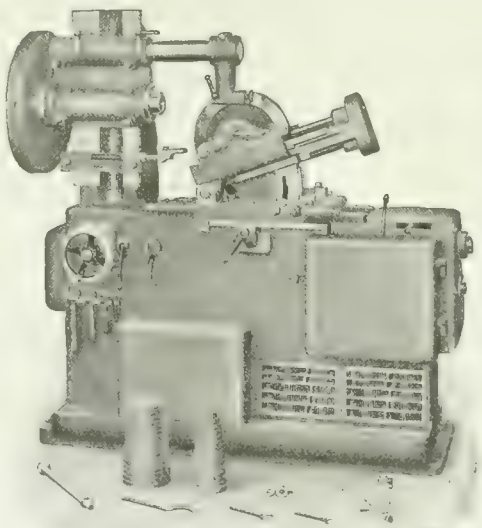
Be sure and get "Drill Chips" every month.

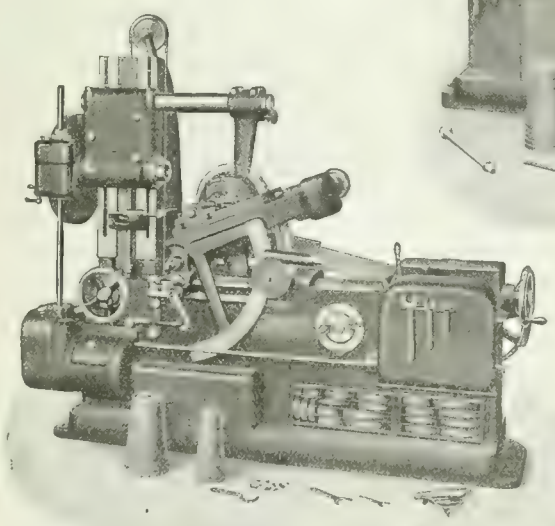
The Cleveland Twist Drill Co.
New York Cleveland Chicago



For Cutting Both Spur and Bevel Gears

Just the type of machines for the shop where both kinds of gears must be produced on the same machine, or bevel gears of various sizes made in quantities.





Above—No. 13 Automatic Gear Cutting Machine for spur or bevel gears to 18" diam. 4" face.

At Left—No. 13 — Heavy Automatic Gear Cutting Machine for spur or bevel gears to 24" diam. 6" face.

Why They Like

B. & S. Automatic Gear Cutting Machines

HANDY TO SET UP AND OPERATE. Operators like them. The simple mechanism with operating parts in easy reach prevents confusion and cuts down non-productive setting-up time.

WORK ACCURATELY AND RAPIDLY. Production men like them. Smooth, powerful cutter drive; large, accurate index wheel, rapid indexing and general sturdy construction all mean good gears cut quickly.

KEEP GEAR COSTS LOW. Managers like them. One man can run several machines, which, with the quick setting-up and fast production, means low costs.

GOOD FOR YEARS OF SERVICE. Owners like them. The solid construction, high quality materials, careful workmanship and inspection insure long life and a paying investment.

Brown & Sharpe Mfg. Co.
Providence, R.I., U.S.A.

Canadian Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, Limited
TORONTO MONTREAL WINNIPEG
CALGARY VANCOUVER ST. JOHN
SASKATOON

Dies, Opening.
W. H. Banfield & Sons, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.

Dies for Screw Plates.
Wells Brothers Co., Greenfield, Mass.

Dies, Sheet Metal Working.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

Dies, Screws and Thread.
Armstrong Mfg. Co., Bridgeport, Conn.
Greenfield Tap & Die Corporation Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Teol Co., Detroit.

Discs, Leather.
Graton & Knight Mfg. Co., Montreal.

Draughtsman's Tools.
Emmert Mfg. Co., Waynesboro, Pa.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Windsor, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Limited, Galt, Ont.

Drift Bolt Cutters.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drill Presses.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
W. P. Davis Machine Co., Rochester, N.Y.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
A. R. Williams Machinery Co., Toronto.

Drilling Machines, Locomotive and Multiple Spindle
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Colburn Mach. Tool Co., Franklin, Pa.
Garvin Machine Co., New York.
Girard Machine & Teol Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial and Turret.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Motch & Merryweather Machy. Co., Cleveland, O.
Newton Machine Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Sensitive.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Rockford Machine Tool Co., Rockford.

Drilling Machines, Upright and Horizontal.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Colburn Mach. Tool Co., Franklin, Pa.
W. P. Davis Machine Co., Rochester, N.Y.
Detrick & Harvey Machine Co., Baltimore, Md.
A. R. Williams Machy. Co., Toronto
W. F. & John Barnes Co., Rockford.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Rockford Machine Tool Co., Rockford.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.

Drilling Posts.
Keystone Mfg. Co., Buffalo, N.Y.

Drills, Bench.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co. Cincinnati.

Drills, Blacksmith and Bit Stock.
Can. Buffalo Forge Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland.
Detroit Twist Drill Co., Detroit, Mich.
Morse Twist Drill and Machine Co. New Bedford.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills Corner (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Drills, Electric and Portable.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Niles-Bement-Pond Co., New York.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Drills, High Speed.
Baker Bros., Toledo, O.
Cleveland Twist Drill Co., Cleveland.
Can. Fairbanks-Morse Co., Montreal.
Detroit Twist Drill Co., Detroit, Mich.
Morse Twist Drill and Machine Co., New Bedford.
W. F. & John Barnes Co., Rockford, Ill.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Multiple Spindle.
Pratt & Whitney Co., Dundas, Ont.
Niles-Bement-Pond Co., New York.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Wiley & Russell, Greenfield, Mass.

Drills, Pneumatic.
John F. Allen Co., New York.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co., Chicago.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Detroit Twist Drill Co., Detroit, Mich.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Drills, Rock.
A. R. Williams Machy. Co., Toronto.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Track.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Twist.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
John Morrow Screw Co., Ingersoll, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drill Holders.
Wells Brothers Co., Greenfield, Mass.

Drill Sockets.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drying Appliances.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Drying Out Barrels.
Baird Machine Co., Bridgeport, Conn.

Drying Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Dump Cars.
Can. Fairbanks-Morse Co., Montreal.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.

Dust Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Dust Arresters (for Tumbling Mills).
W. W. Sly Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Dynamos and Electrical Supplies.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Electrical Instruments.
Brown Inst. Co., Philadelphia, Pa.

Electrical Supplies.
Duncan Electrical Co., Montreal.

Elevator Enclosures.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Elevating and Conveying Machinery.
Barkey Bros., Stouffville, Ont.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Plessisville Foundry, Plessisville, Que.

Emery Grinders (Pneumatic).
Barkey Bros., Stouffville, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Emery and Emery Wheels.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Hamilton, Ont.
Dom. Abrasive Wheel Co., Toronto.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.
Canadian Hart Wheels, Hamilton, Ont.
Dom. Abrasive Wheel Co., Toronto.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co. Hamilton, Ont.
Norton Co., Worcester, Mass.

Emery Wheel Safety Flanges.
Canadian Hart Wheels, Hamilton, Ont.

Enameling Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Engines, Corliss, Compound, Pumping.
Wm. Tod Company, Youngstown, O.

Engines, Gas and Gasoline.
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal.
National Machinery & Supply Co., Hamilton.
Wm. Tod Company, Youngstown, O.

Engines, Horizontal and Vertical.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
A. R. Williams Machy. Co., Toronto.
Sheldons, Ltd., Galt, Ont.
Wm. Tod Co., Youngstown, O.

Engines, High-Speed, Automatic.
Can. Buffalo Forge Co., Montreal.

Engines, Steam.
Can. Buffalo Forge Co., Montreal.
John Inglis Co., Toronto.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.

Engineers, Industrial.
Hooper-Falkenau Eng. Co., New York.

Engineering Books.
The MacLean Publishing Co., Ltd., Toronto.

Engraving Machines.
Geo. Gorton Machine Co., Racine, Wis.

Elevators and Buckets.
Eastern Machinery Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Equipment Shop.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Wm. Tod Co., Youngstown, O.

Escutcheon Pins.
Parmenter & Bulloch Co., Gananoque.

Evaporators' Machinery.
Brown, Boggs & Co., Hamilton, Can.

Exhaust Heads and Hoods.
Can. Buffalo Forge Co., Montreal.
Can. Steel Products Co., Montreal.
Can. Fairbanks Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.

Experimental Machinery.
Owen Sound Iron Works Co., Owen Sound.

Fans.
Can. Buffalo Forge Co., Berlin, Ont.
Baird Machine Co., Bridgeport, Conn.
Can. Sirocco Co., Ltd., Windsor, Ont.
Plessisville Foundry, Plessisville, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Feed Water Heaters.
Can. Fairbanks-Morse Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Fence, Iron Factory.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Files.
American Swiss File & Tool Co., New York.
Delta File Works, Philadelphia, Pa.
Nicholson File Co., Port Hope, Ont.

Fire Extinguishers.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Fire Escapes.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Flexible Shafts.
Chicago Flexible Shaft Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.

Forges, Hand, etc.
Can. Buffalo Forge Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
National Machinery & Supply Co., Hamilton.
Sheldons, Limited, Galt, Ont.

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
J. H. Williams Co., Brooklyn, N.Y.

Forging Hammers, Belt-Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Plessisville Foundry, Plessisville, Que.

Forging Hammers, Steam.
Erie Foundry Co., Erie, Pa.

Forging Ingots.
Electric Steel & Metals Co., Welland.

Forging Machinery.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
National Machinery Co., Tiffin, Ohio.
Plessisville Foundry, Plessisville, Que.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Foundry Engineers.
Hooper-Falkenau Eng. Co., New York.

Foundry Equipment.
Northern Crane Works, Walkerville.
W. W. Sly Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Friction Leathers.
Graton & Knight Mfg. Co., Montreal.

Friction Clutch Pulleys, etc.
Baird Machine Co., Bridgeport, Conn.
Eastern Machinery Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.

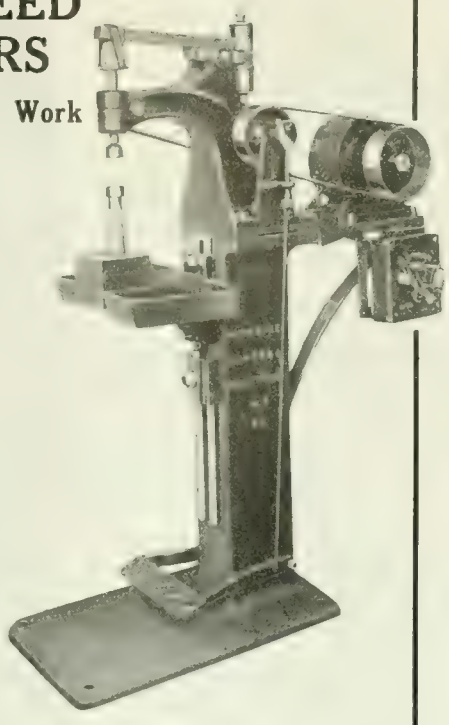
Furnace Engineers and Contractors.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Oil, Coal, Gas and Electric.
Canadian Hoskins, Limited, Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
W. S. Rockwell Co., New York.
Strong, Carlisle & Hammond, Cleveland, O.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Steel Heating and Brass Melting.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
W. S. Rockwell Co., New York.
Strong, Carlisle & Hammond, Cleveland, O.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

HIGH SPEED HAMMERS

For High Speed Work



FEATURES:

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

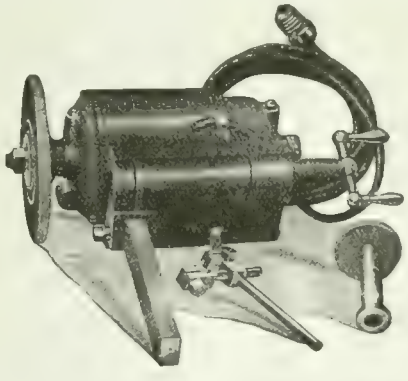
THE HIGH SPEED HAMMER CO.

Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

Stow Tool Post Grinder

Does the most accurate of work—patent bearings, for Internal and Surface Grinding—A.C. or D.C. Immediate shipment from stock. Plain or with slide.



One of the many electric portable tools built by

Stow Manufacturing Co.

Binghamton, N.Y.

Oldest portable tool manufacturers in America.
London Stock, 85 Queen Victoria St.

THESE ARE THE HOLDERS FOR THE "MORSE" ROUND DIES

Strongly made and easy to adjust.

Dies are made in all common shapes of thread with a great range.

Sold singly or in sets.

CATALOG

MORSE TWIST DRILL & MACHINE CO.

NEW BEDFORD MASS., U.S.A.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Furnaces, Heat Treating, Hardening and Tempering.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
W. S. Rockwell Co., New York.
Strong, Carlisle & Hammond, Cleveland, O.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Forging.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Annealing, etc.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
W. S. Rockwell Co., New York.
Strong, Carlisle & Hammond, Cleveland, O.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces for Baking, Bluing, Drying, Enameling, Japanning and Lacquering.
Oven Equipment & Mfg. Co., New Haven, Conn.

Furnace Lining.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Fuse Cap Machinery.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago.

Gaskets, Leather, etc.
Graton & Knight Mfg. Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Gas Blowers and Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.

Gas Burners.
Oven Equipment & Mfg. Co., New Haven, Conn.

Gas Machines.
Brown, Boggs & Co., Hamilton, Can.

Gas Producer Plants.
Can. Fairbanks-Morse Co., Montreal.

Gauges, Hydraulic Pressure.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Gauges, Standard.
Brown Inst. Co., Philadelphia, Pa.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Holden-Morgan Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Garvin Machine Co., New York.
National Machinery & Supply Co., Hamilton.

Gear-Cutting Machinery.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
Newton Machine Tool Works, Inc., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Sheldons, Limited, Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Wm Tod Co., Youngstown, O.
D. E. Whiton Machine Co., New London, Conn.

Gears, Cut, Mortise, Angle, Worm.
Earle Gear & Machine Co., Philadelphia, Pa.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Jones & Glassco, Montreal, P.Q.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.
Wm Tod Co., Youngstown, O.

Gears, Rawhide.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal, P.Q.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Generators, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Grain for Polishing.
Norton Co., Worcester, Mass.

Grates, Shaking and Dumping.
Erie Foundry Co., Erie, Pa.

Graphite.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Jos. Dixon Crucible Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Gravity Lowering Blocks.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.

Grease Lubriko.
Commercial Oil Co., Hamilton, Ont.

Grinders, Automatic Knife.
W. H. Banfield & Son, Toronto.

Grinders, Centre, Pedestal and Bench.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Machine Co., Hamilton.
Gray Mfg. & Machine Co., Toronto.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
New Britain Machine Co., New Britain, Conn.
Norton Grinding Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Grinders, Cutter.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., Dundas, Ont.

Grinders, Die Chaser.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Disk.
Armstrong Bros. Tool Co., Chicago, Ill.
Gardner Machine Co., Beloit, Wis.
Norton Grinding Co., Worcester, Mass.

Grinders, Drill.
Garvin Machine Co., New York.
United States Electric Tool Co., Cincinnati, O.

Grinders, Cylinder, Internal.
Bath Grinder Co., Fitchburg, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinder Co., Fitchburg, Mass.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Grinding Co., Worcester, Mass.
Rivett Lathe & Grinder Co., Boston, Mass.

Grinders, Pneumatic.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Grinders, Portable, Electric, Hand, Tool, Post, Floor and Bench.
Baird Machine Co., Bridgeport, Conn.
Bath Grinder Co., Fitchburg, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinder Co., Fitchburg, Mass.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Hisey-Wolf Machine Co., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Co., Worcester, Mass.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machy. Co., Toronto.

Grinders, Swing, Portable, Electric.
Hisey-Wolf Machine Co., Cincinnati, O.
United States Electrical Tool Co., Cincinnati.

Grinders, Tool and Holders.
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Bath Grinder Co., Fitchburg, Mass.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinder Co., Fitchburg, Mass.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
Rivett Lathe & Grinder Co., Boston, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

Grinders, Universal, Plain.
Girard Machine & Tool Co., Philadelphia, Pa.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Vertical Surface.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.

Grinding and Polishing Machines, Portable, Pneumatic and Spring Frame.
Bath Grinder Co., Fitchburg, Mass
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Fitchburg Grinder Co., Fitchburg, Mass.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Gray Mfg. & Machine Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Independent Pneumatic Tool Co., Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Norton Co., Worcester, Mass.
Stow Mfg. Co., Binghamton, N.Y.

Grinding Machines (Railroading).
Newton Machine Tool Works, Philadelphia, Pa.

Grinding Wheels.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Carborundum Co., Niagara Falls.
Dom. Abrasive Wheel Co., Toronto.
Ford-Smith Machine Co., Hamilton, Canada.
Gray Mfg. & Machine Co., Toronto.
Norton Co., Worcester, Mass.

Guards, Window and Machine.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Hack Saw Blades.
Victor Saw Works, Ltd., Hamilton, Canada.
Diamond Saw & Stamping Works, Buffalo, N.Y.
L. S. Starrett Co., Athol, Mass.

Hack Saw Frames.
Ford-Smith Machine Co., Hamilton, Canada.
Garvin Machine Co., New York City.
Mussens, Limited, Montreal.

Hammer High Speed.
High Speed Hammer Co., Rochester, N.Y.

Hammers, Drop and Belt Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
Canadian Billings & Spencer, Ltd., Welland.
A. B. Jardine & Co., Hespeler, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que
Toledo Machine & Tool Co., Toledo.

Hammers, Helve Power.
Weet Tire Setter Co., Rochester, N.Y.

Hammers, Pneumatic.
Independent Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., of Canada, Toronto.

Hammers (Rawhide).
Chicago Rawhide Mfg. Co., Chicago, Ill.

Hammers, Steam.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.

Hand Hoists & Trolleys.
Whiting Foundry Equipment Co., Harvey, Ill.

Hand Leathers or Pads.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Montreal.

Hangers.
Baird Machine Co., Bridgeport, Conn.
Gardner, Robt., & Son, Montreal.
The Smart-Turner Machine Co., Hamilton.
Standard Pressed Steel Co., Philadelphia, Pa.

Hardness Testing Instruments.
Shore Instrument & Mfg. Co., New York.

Heating and Ventilating Engineers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Hooper-Falkenau Eng. Co., New York.
Sheldons, Ltd., Galt, Ont.

Heat Gauges, Hardening and Annealing.
Shore Instrument & Mfg. Co., New York.

Hinge Machinery.
Baird Machine Co., Bridgeport, Conn.

Hinges.
London Bolt & Hinge Works, London, Ont.

Hoists, Hydraulic.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hoisting and Conveying Machinery.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound.
Southwark Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Chain, Electric and Pneumatic.
Northern Crane Works, Walkerville.
Vulcan Engineering Sales Co., Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Hose Clamp Tool.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Hose, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Hose, Steam, Suction and Water.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Holders for Dies and Drills.
Wells Brothers, Company, Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Hydraulic Accumulators.
Can. Boomer & Boschert Press Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
The Smart-Turner Machine Co., Hamilton
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hydraulic Machinery.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Niles-Bement-Pond Co., New York.
John Inglis Co., Toronto.
National Machinery & Supply Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.
R. D. Wood Co., Philadelphia, Pa.

Indicators, Speed.
Brown Inst. Co., Philadelphia, Pa.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

Index Centres.
Garvin Machine Co., New York.

Industrial Engineers.
Hooper-Falkenau Eng. Co., New York.

Ingot Metals.
M. & L. Samuel, Benjamin & Co., Toronto.

Iron Filler.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Iron Ore.
Hanna & Co., M. A., Cleveland, O.

Jacks, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N. J.

Jacks.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Plessisville Foundry, Plessisville, Que.

Jacks, Pneumatic.
Northern Crane Works, Walkerville.

Jacks, Pit and Track.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Watson-Stillman Co., Aldene, N.J.

Japanning Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Jaws, Face Plate.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

Why go to the expense of buying new machines for the manufacture of

SHELLS?

We have already shipped some 75 carloads of

Rebuilt Machine Tools

to CANADA since the outbreak of the war, with absolute satisfaction in each case.

If you need any equipment it will be to your advantage to get in touch with us as our facilities for furnishing rebuilt machinery are second to none on the continent.

EVERY MACHINE WE BUY IS PUT THROUGH OUR OWN SHOPS AND COMES OUT IN ABSOLUTELY PERFECT ORDER—AND WE STAND BEHIND EVERY ONE WE SELL.

The demand is enormous, but we are not taking advantage of the war by putting on exorbitant prices—our aim is a good, square deal to everybody all the time. You can often get something practically equal to a new machine at a very great saving in price.

As we carry a large stock, we can likely supply you from stock, or if we cannot do this, we will take your order for future delivery, specifying a definite time when we will supply you with such tools as you may require.

New York Machinery Exchange
50 Church St., New York

"Hand Work"

How to Save It

"HAND WORK" is always a big item of cost in many lines. Millions have been spent on machinery, to save a small fraction of the world's "hand work."

YOU can save in YOUR filing—and make the saving more than pay its way—by keeping your workmen supplied with *efficient* files. When they continue to use files whose first—and BEST—efficiency is lost—they take money from your pocket—pad the cost-sheet on every piece they file.

Make it an iron-clad shop rule that when a file becomes worn on any work, it must be instantly discarded and replaced with a new, efficient one of the "Famous Five":

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE
(Made in Canada)

ENFORCE THIS RULE:

Give your workmen the benefit of our **50 years' experience**—our **five** great plants—our **60,000,000 yearly** output—our complete **control** of every step in a good file's making—of the UNIFORM high quality and service that captured 90% of Canada's file trade—and get an EXTRA NET PROFIT from your business.

"File Filosophy" tells HOW. Write for FREE copy and our Catalog TO-DAY.

Nicholson File Company
Port Hope Dealers Everywhere **Ontario**

Jigs, Tools, etc.
Hamilton Gear & Machine Co., Toronto.

Key Seaters.
Baker Bros., Toledo, O.
W. P. Davis Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Machine Tool Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.

Kilns.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt, Ont.

Lacquering Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Lacing, Belt.
Chicago Rawhide Mfg. Co., Chicago, Ill.

Ladles, Foundry.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Lag Screw Gimlet Pointers.
National Machy. Co., Tiffin, Ohio.

Lamps, Arc and Incandescent.
Can. Fairbanks-Morse Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Ker & Goodwin, Brantford.

Lathe Chucks.
Ker & Goodwin, Brantford.

Lathe Attachment for Shells.
Lymburner, Ltd., Montreal.

Lathes, Automatic.
Windsor Machine Co., Windsor, Vt.

Lathe Dogs and Attachments.
Armstrong Bros. Tool Co., Chicago.
Bridgeford Machine Tool Works, Rochester, N.Y.
Fay & Scott, Dexter, Maine.
Hendey Machine Co., Torrington, Conn.
J. H. Williams Co., Brooklyn, N.Y.

Lathes, Bench.
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.

Lathes, Engine.
A. R. Williams Machy. Co., Toronto.
Barnes Drill Co., Rockford, Ill.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Bridgeford Machine Tool Works, Rochester, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N.Y.
Fay & Scott, Dexter, Maine.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rahn-Larmon Co., Cincinnati, O.

Lathes, Extension Gap.
Barnes Drill Co., Rockford, Ill.

Lathe Pans.
New Britain Machine Co., New Britain, Conn.

Lathes, Patternmakers'.
J. G. Blount Co., Everett, Mass.
Fay & Scott, Dexter, Maine.
Mussens, Limited, Montreal.

Lathes, Screw Cutting.
A. R. Williams Machy. Co., Toronto.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Cincinnati Iron & Steel Co., Cincinnati, O.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.

Lathes, Spinning.
Bliss, E. W., Co., Brooklyn, N.Y.
Toledo Mach. & Tool Co., Toledo, O.

Lathe, Turret and Speed.
Acme Machine Tool Co., Cincinnati, O.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, O.
Colburn Machine Tool Co., Franklin, Pa.
W. P. Davis Machine Co., Rochester
Fay & Scott, Dexter, Maine.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rahn-Larmon Co., Cincinnati, O.
A. G. Walworth & Co., Chicago, Ill.
Warner & Swasey Co., Cleveland, O.
Windsor Machine Co., Windsor, Vt.
A. R. Williams Machy. Co., Toronto.

Leather, Cup.
Chicago Rawhide Mfg. Co., Chicago, Ill.

Leather, Pump, Valve, Hydraulic, Etc.
Chicago Rawhide Mfg. Co., Chicago, Ill.

Leather Strapping.
Graton & Knight Mfg. Co., Montreal.

Lifts, Pneumatic.
Whiting Foundry Equipment Co., Harvey, Ill.

Link Belting.
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.
Jones & Glassco, Montreal.

Linoleum Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.

Liquid Air.
L'Air Liquide Society, Montreal, Toronto.

Lockers, Steel Wardrobe and Steel Material.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Lockers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Locomotive Equipment.
Can. Locomotive Co., Kingston, Ont.

Locomotives, Railroading, Contracting.
Can. Locomotive Co., Kingston, Ont.
National Machinery & Supply Co., Hamilton.

Locomotives, Turn Tables.
Can. Bridge Co., Walkerville, Ont.

Lubricants.
Can. Economic Lubricant Co., Montreal.
Cataract Refining Co., Toronto.
Commercial Oil Co., Hamilton, Ont.

Machine Divided Rules.
Lufkin Rule Co., Saginaw, Mich.

Machine Tools.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Modern Tool Co., Erie, Pa.
Newton Machine Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Machinery Dealers.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

Machinery Guards.
Jones & Glassco, Montreal, P.Q.
Canada Wire & Iron Goods Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Machinery Repairs.
Cunningham & Sons, St. Catharines, Ont.
Plessisville Foundry, Plessisville, Que.

Machinists' Scales, Small Tools and Supplies.
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

Mandrels.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. R. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Marine Engines.
Cunningham & Sons, St. Catharines, Ont.

Marking Machinery.
Hebden-Morgan Co., Toronto.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Marquises.
Dennis Wire & Iron Works, London, Ont.

Measuring Tapes and Rules.
James Chesterman & Co., Ltd., Sheffield, Eng.
Lufkin Rule Co., of Canada, Windsor, Ont.

Mechanical Engineers.
Hooper-Falkenau Eng. Co., New York.

Metallurgists.
Toronto Testing Laboratory, Ltd., Toronto.

Metal Cutting Machines.
Racine Tool & Machine Co., Racine, Wis.

Metal Stamping.
Duncan Electrical Co., Montreal.

Meters, Electrical.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Mill Machinery.
Cunningham & Sons, St Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.

Milling Attachments.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Cincinnati.
Hendey Mach. Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee.
Kempsmith Mfg. Co. Milwaukee, W.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Horizontal and Vertical.
A. R. Williams Machy. Co., Toronto.
Brown & Sharpe Mfg. Co., Providence.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
Gooley & Edlund, Cortland, N.Y.
Kearney & Trecker Co., Milwaukee.
Kempsmith Mfg. Co., Milwaukee, W.
Motch & Merryweather Machy. Co., Cleveland, O.
Newton Machine Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Crescent Oil Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Keyseat.
Newton Machine Tool Works, Philadelphia, Pa.

Milling Machines, Multiple Spindle, Duplex, Etc.
Newton Machine Tool Works, Philadelphia, Pa.

Milling Machines, Plain, Bench and Universal.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hendey Machine Co., Torrington.
Kearney & Trecker Co., Milwaukee.
Kempsmith Mfg. Co., Milwaukee, Wis.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
A. R. Williams Machy. Co., Toronto.

Milling Machines, Profile.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

Milling Tools.
Brown & Sharpe Mfg. Co., Providence.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, W.

Mine Cars and Hitchings.
Pratt & Whitney Co., Dundas, Ont.
Modern Tool Co., Erie, Pa.
Can. Fairbanks-Morse Co., Montreal.

Mining Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Mortising Machines.
Jones & Glassco, Montreal.

Motors, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Motors, Pneumatic.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Multiple Index Centres.
Garvin Machine Co., New York.

Nipple Threading Machines.
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

Nitrogen.
L'Air Liquide Society, Montreal, Toronto.

Nozzles, Spray.
Can. Buffalo Forge Co., Montreal.

Nuts, Semi-Finish and Finished.
Galt Machine Screw Co., Galt, Ont.
John Morrow Screw Co., Ingersoll, Ont.

Nut Burring Machines.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Machines (Hot).
National Machy. Co., Tiffin, O.

Nut Facing and Bolt Shaving Machines.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Tappers.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. R. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Wrenches.
Wells Brothers Co., Greenfield, Mass.

Oil Separators.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Oil Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Oils, Lubricating, Tempering.
Commercial Oil Co., Hamilton, Ont.

Ovens for Baking, Bluing, Drying, Enamelling, Japanning, and Lacquering.
Geo. Gorton Machine Co., Racine, Wis.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Oven Trucks, Steel.
Oven Equipment & Mfg. Co., New Haven, Conn.

Ovens for Drying, Temper and Under Trucks.
Oven Equipment & Mfg. Co., New Haven, Conn.

Oscillating Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Oxy-Acetylene Welding and Cutting Plants.
L'Air Liquide Society, Montreal, Toronto.

Oxygen.
L'Air Liquide Society, Montreal, Toronto.

Packings, Leather, Hydraulics, Etc.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Montreal.

Packing, Rubber, etc.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Pans, Lathe.
Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.
Cleveland Wire Spring Co., Cleveland

Paper Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.
Can. Sirocco Co., Ltd., Windsor, Ont.

Partitions.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Patent Solicitors.
H. J. S. Dennison, Toronto.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Ross Thomson & Co., Ottawa, Ont.

Patterns.
Galt Malleable Iron Co., Galt.
Guelph Pattern Works, Guelph.
Hamilton Pattern & Foundry Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound, Ont.
Plessisville Foundry, Plessisville, Que.
Toronto Pattern Works, Toronto.
Wells Pattern & Machine Works, Toronto.

Patterns, Metal and Wood.
Guelph Pattern Works, Guelph, Ont.

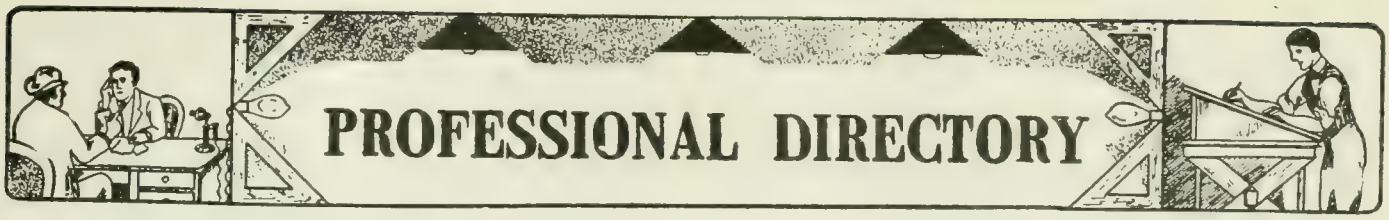
Perforated Metals and Ornamental Iron Goods.
Canada Wire & Iron Goods Co., Hamilton.

Penstocks.
Polson Iron Works, Toronto.

Phosphor Bronze Castings.
Tallman Brass & Metal Co., Hamilton.

Pig Iron.
Hanna & Co., M. A., Cleveland, O.
Stevens, F. B., Detroit, Mich.

Pinions, Mill Cut.
Wm. Tod Co., Youngstown, O.



PATENTS

FRED. B. FETHERSTONHAUGH, K.C. RUSSEL S. SMART, B.A., M.E.
FETHERSTONHAUGH & CO.
The Old-Established Firm
Legal Department **FETHERSTONHAUGH & SMART** 5 ELGIN STREET, OTTAWA
Head Office, ROYAL BANK BUILDING, TORONTO
Send to Dept. C, 5 Elgin Street, Ottawa, for free copy "Plain Practical Pointers" and copy "National Progress," in which clients' patents are advertised.

ROSS THOMSON & CO.

OTTAWA Can.
WASHINGTON U.S.A.
LONDON Eng.
PARIS Fr.
SEND FOR FREE BOOK—PATENT PROTECTION—PERSONAL ATTENTION GIVEN ALL CASES AT PATENT OFFICE

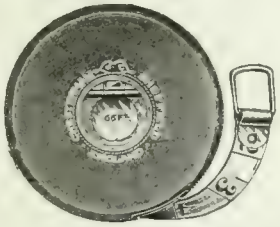
PATENTS
TRADE MARKS, DESIGNS AND COPYRIGHTS
ALL COUNTRIES.
Specialists on Infringement Cases.
H. J. S. DENNISON
PATENT ATTORNEY AND EXPERT.
Star Building, 18 King St. West, TORONTO

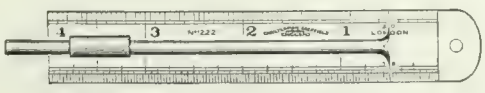
PATENTS PROMPTLY SECURED
In all countries. Ask for our Inventor's Adviser, which will be sent free.
MARION & MARION, 364 University St.
Merchants Bank Building, corner St. Catherine St., MONTREAL, Phone Up 6474 and Washington, D.C., U.S.A.

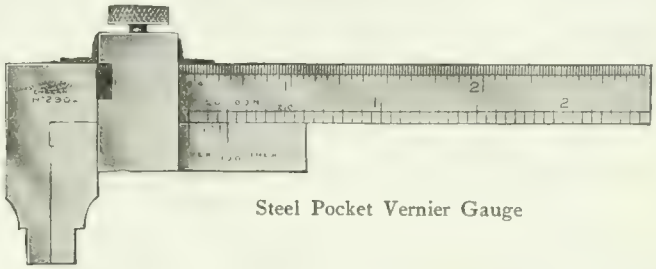
KINDLY MENTION THIS PAPER WHEN WRITING TO ADVERTISERS.

Special Machinery
MADE TO ORDER
Mill Machinery, Engine Work
Grey Iron and Brass Castings
TRY US FOR GENERAL REPAIRS
ALEXANDER FLECK, LIMITED
(Vulcan Iron Works) OTTAWA, ONT.

JAMES CHESTERMAN & CO., Limited
SHEFFIELD, - ENGLAND
Manufacturers of Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools.


Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle.


Steel Depth Gauge


Steel Pocket Vernier Gauge

If your dealer cannot supply you, write for catalogues, prices, etc., direct to
F. H. SCOTT, 404 Coristine Building, MONTREAL

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Pipe Cutting and Threading Machines.
A. R Williams Machy. Co., Toronto.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Butterfield & Co., Rock Island ,Que.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro. Pa.
R. McDougall Co., Galt.
Trimont Mfg. Co., Roxbury, Mass.
Williams Tool Co., Erie, Pa.

Pipe Cutters, Rolling.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
John H. Hall & Sons, Ltd., Brantford, Ont.

Pipe Straightening Machines.
Watson-Stillman Co., Aldene, N.J.

Planer Drives, Electrical.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Niles-Bement-Pond Co., New York.

Planer Jacks.
Armstrong Bros. Tool Co., Chicago.

Planers, Standard and Rotary.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Machine Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., New York.

Planing and Shaping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co. Montreal.
Detrick & Harvey Machine Co., Baltimore, Md.
Fay & Scott, Dexter, Maine.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

Planing Mill Exhausters.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Pliers.
Canadian Billings & Spencer, Ltd., Welland.
McKaig Drop Forge Co., Buffalo, N.Y.

Pneumatic Tools.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Independent Pneumatic Tool Co., Chicago, New York.

Polishing Machines, Electric and Band.
Can. H. W. Johns-Manville Co., Toronto.

Portable Vise Stands.
New Britain Machine Co., New Britain, Conn.

Portable Steel Tool Racks.
New Britain Machine Co., New Britain, Conn.

Portable Steel Work Stands.
New Britain Machine Co., New Britain, Conn.

Power Plant Engineers.
Hooper Falkenau Eng. Co., New York.

Power Plant Equipments.
Can. Fairbanks-Morse Co., Montreal.

Power Transmission.
The Smart-Turner Mach. Co., Hamilton.

Press Screw (Adjustable).
W. F. & John Barnes Co., Rockford.

Presses, Bench Straightening.
Toledo Machine & Tool Co., Toledo.

Presses for Shells.
Can. Boomer & Boschert Press Co., Montreal
Can. Locomotive Co., Kingston, Ont.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago
Goldie & McCulloch Co., Galt, Ont.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.
R. D. Wood Co., Philadelphia, Pa.

Presses, Cam, Toggle, Eyelet.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo, O.

Presses, Broaching.
E. W. Bliss Co., Brooklyn, N.Y.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman & Co., Aldene, N.J.

Presses, Drop.
W. H. Banfield & Son, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Boomer & Boschert Press Co., Montreal.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Filter.
Lymburner, Ltd., Montreal.

Presses, Forging.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago, Ill.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Wm. Tod Co., Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago, Ill.
Hydraulic Press Co., Mt. Gilead.
Niles-Bement-Pond Co., New York.
Wm. Tod Company, Youngstown, O
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.
R. D. Wood Co., Philadelphia, Pa.

Presses, Pneumatic.
Toledo Machine & Tool Co., Toledo.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Can. Boomer & Boschert Press Co., Montreal
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Geo. Gorton Machine Co., Racine.
Girard Machine & Tool Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.
A. R. Williams Machy. Co., Toronto.

Presses, Scrap Baling.
Can. Boomer & Boschert Press Co., Montreal.
Watson-Stillman Co., Aldene, N.J.

Presses, Spring Foot.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo.
Brown, Boggs & Co., Hamilton, Can.

Presses, Screw.
Can. Boomer & Boschert Press Co Montreal.

Pressure Regulators.
Can. Fairbanks-Morse Co., Montreal.

Protective Paint.
Jos. Dixon Crucible Co., Jersey City.

Pulleys.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Positive Clutch & Pulley Works, Ltd., Toronto.
The Smart-Turner Mach. Co., Hamilton.

Pulley Machinery, Drilling and Tapping.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

Pumps, High Pressure.
Charles F. Elmes Eng. Works, Chicago
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Pumping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
The Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm Tod Company, Youngstown, O.

Pumps, all Kinds.
Can. Buffalo Forge Co., Montreal.
Charles F. Elmes Eng. Works Chicago
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
Owen Sound Iron Works Co., Owen Sound.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Watson-Stillman Co., Aldene, N.J.
Wayne Oil Tank & Pump Co., Fort Wayne.

Pumps, Electrically Driven.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
The Smart Turner Mach. Co., Hamilton.

Pumps, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Pumps, Steam.
Wm. Tod Company, Youngstown, O.

Pump Leathers.
Graton & Knight Mfg. Co., Montreal.
Southwark Foundry & Machine Co., Philadelphia.

Punches and Dies.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Scott Bros., Halifax, Eng.
Gardner, Robt., & Son, Montreal.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.
A. O. Walworth & Co., Chicago, Ill.

Punches, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.
A. O. Walworth & Co., Chicago, Ill.

Punches, Pneumatic.
Jno. F. Allen Co., New York.

Punching Machines, Horizontal.
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Long & Alstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.

Pyrometers.
Brown Instrument Co., Philadelphia, Pa.
Canadian Hoskins, Limited, Walkerville, Ont.
Shore Instrument & Mfg. Co., New York City.
Thwing Instrument Co., Philadelphia, Pa.

Quartering Machines.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

Ratchet Wrenches.
Wells Brothers Co., Greenfield, Mass.

Railing, Iron and Brass.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Rail Benders.
Niles-Bement-Pond Co., New York.

Railroad Tools.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

Railroad Tools, Hydraulic.
Watson Stillman Co., Aldene, N.J.

Rammers, Bench and Floor.
Guelph Pattern Works, Guelph, Ont.

Rapping Plates.
Stevens, F. B., Detroit, Mich.

Ratchets.
Keystone Mfg. Co., Buffalo, N.Y.

Raw Hide Pinions.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Smart-Turner Machine Co., Hamilton, Ont.

Reamers, Adjustable.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Detroit Twist Drill Co., Detroit, Mich.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co., Greenfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Reamers, Bridge, Expanding and High Speed.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Reamer Fluting Machines.
Garvin Machine Co., New York.

Reamers, Pipe, Cylinder and Locomotive.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reaming Machines, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Reamers, Steel Taper and Self-Feeding.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Rebuilt Machine Tools.
New York Machy. Co., New York.

Reels.
Baird Machine Co. Bridgeport, Conn.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Revolution Indicators and Recorders.
Brown Instrument Co., Philadelphia, Pa.

Rheostats.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Rivet Machines.
Buffalo Forge Co., Buffalo, N.Y.
National Machinery Co., Tiffin, O.

Rivets, Tubular, Bifurcated.
Parmenter & Bulloch Co., Gananoque.

Rivets, Iron, Copper and Brass.
Parmenter & Bulloch Co., Gananoque.

Riveters, Pneumatic, Hydraulic.

Hammer, Compression.
Jno. F. Allen Co., New York.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co. of Chicago, Ill.
National Mach. & Sup. Co., Hamilton
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Riveting Machines, Elastic Rotary Blow.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
Southwark Foundry & Machine Co., Philadelphia.

Rolls, Bending.
John Bertram & Sons Co., Dundas, Ont
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

Rolling Mill Machinery.
Wm. Tod Co., Youngstown, O.

Roofing.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rotary Converters.
A. R. Williams Machy. Co., Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Rubber Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rules.
Brown & Sharpe Mfg. Co., Providence, R.I.
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

Safety Set Screws.
Allen Mfg. Co., Inc., Hartford, Conn.

Sand Blasts.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Gray Mfg. & Machine Co., Toronto.
W. W. Sly Mfg. Co., Cleveland, O.

Saw Blades.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Huther Bros. Saw Mfg. Co., Rochester, N.Y.

Saw Tables.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.

Saw Sharpening Machines.
Nutter & Barnes Co., Hinsdale, N.H.

Saw Mill Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt. & Son, Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Espen Lucas Machine Works, Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Plessisville Foundry, Plessisville, Que.

Sawing Machines, Cold Metal.
Newton Machine Tool Works, Philadelphia, Pa.

START RIGHT NOW

And PLAN To Attend

The Foundry and Machine Exhibition

The biggest and most important Foundry and Machine Exhibition ever held.

The Time: Sept. 25th to Oct. 1st, 1915

The Place: ATLANTIC CITY

It's up to every live Canadian Manufacturer to arrange to have his foremen—machinists—and purchasing agents attend this exhibition. It will prove worth many times the cost and the time. Remember this is

YOUR EXHIBITION.

Thousands of dollars are being spent by exhibitors and the management of the exhibition to provide you with every possible means for your profit and enjoyment.

If there is any information you might desire regarding the BIG EVENT such will be gladly furnished by

The Foundry and Machine Exhibition Co.

1949 West Madison Street, CHICAGO, ILL.

Saws, High-Speed, Friction.
Espen Lucas Machine Works, Philadelphia, Pa.
Earle Gear & Machine Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Nutter & Barnes Co., Hinsdale, N.H.

Saws, Inserted Tooth.
Earle Gear & Machine Co., Philadelphia, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Huther Bros. Saw Mfg. Co., Rochester, N.Y.
Q. M. S. Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hack.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
L. S. Starrett Co., Athol, Mass.

Saws, Circular Metal.
Earle Gear & Machine Co., Philadelphia, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Huther Bros. Saw Mfg. Co., Rochester, N.Y.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hot and Cold.
Earle Gear & Machine Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Huther Bros. Saw Mfg. Co., Rochester, N.Y.
Nutter & Barnes Co., Hinsdale, N.H.
Q. M. S. Co., Chicago, Ill.
Vulcan Eng. Sales Co., Chicago, Ill.

Scleroscopes.
Shore Instrument & Mfg. Co., New York City.

Screws, Caps and Set.
Galt Machine Screw Co., Galt, Ont.
John Morrow Screw Co., Ingersoll, Ont.

Screw Machine Products.
Galt Machine Screw Co., Galt, Ont.
John Morrow Screw Co., Ingersoll, Ont.
Wallace, Barnes Co., Bristol, Conn.

Screw Machines, Hand, Automatic.
Acme Machine Tool Co., Cincinnati, O.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
A. B. Jardine & Co., Hespeler.
Motch & Merryweather Machy. Co., Cleveland, O.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
A. O. Walworth & Co., Chicago, Ill.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Windsor Machine Co., Windsor, Vt.

Screw Machines, Multiple Spindle.
New Britain Machine Co., New Britain, Conn.
Windsor Machine Co., Windsor, Vt.

Screw Plates.
Butterfield & Co., Rock Island, Que.
Can. Tap & Die Co., Galt, Ont.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Wells Brothers Co., Greenfield, Mass.
Wiley & Russell Co., Greenfield, Mass.

Screw Slotters.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Set Screws, Safety.
Allen Mfg. Co., Hartford, Conn.

Second-Hand Machinery.
New York Machinery Co., New York.
Gardner, Robt. & Son, Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Gardner, Robt. & Son, Montreal.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.

Shanks, Straight and Taper.
Jacobs Mfg. Co., Hartford, Conn.

Shapers.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
W. P. Davis Machine Co., Rochester, N.Y.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Ct.
Hill, Clarke & Co., of Chicago, Chicago, Ill.

Shafting.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Newton Machine Tool Works, Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stockbridge Machine Co., Worcester, Mass.

Sharpening Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Shavings, Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Shearing Machines, Angle Iron, Bar and Gate.
John Bertram & Sons Co., Dundas.
Bertrams, Ltd., Edinburgh, Scotland.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler.
Long & Alstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown Boggs Co., Ltd., Hamilton, Canada.
Buffalo Forge Co., Buffalo, N.Y.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machy. Co., Tiffin, Ohio.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.

Shears, Lever, Hydraulic.
Watson-Stillman Co., Aldene, N.J.

Shears, Pneumatic.
John F. Allen Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio.

Shears, Squaring.
Brown, Boggs, & Co., Hamilton, Can.

Sheet Steel.
Dom. Sheet Metal Co., Hamilton, Ont.

Sheet Metal Working Tools.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont

Sheet Metal Stampings.
Duncan Electrical Co., Montreal.

Shell Banding Machines, Hydraulic.
Can. Locomotive Co., Kingston, Ont.
Lymburner, Ltd., Montreal.
Motch & Merryweather Machy. Co., Cleveland, O.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.

Shell Painting Machine.
Can. Locomotive Co., Kingston, Ont.

Shell Screws, Headless.
Blake & Johnson, Waterbury, Conn.

Shelving, Steel Partitions.
Canadian Steel Products Company, Montreal.

Shrapnel Shell Forging, Drilling Machines.
Barnes Drill Co., Rockford, Ill.

Shrapnel Shell Marker.
Brown-Boggs Co., Hamilton, Ont.
Holden Morgan Co., Toronto.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pangborn Corporation, Hagerstown, Md.

Shrapnel Sand Blasts.
Pangborn Corporation, Hagerstown, Md.
W. W. Sly Mfg. Co, Cleveland, O.

Side Tools.
Armstrong Bros. Tool Co., Chicago.

Slotters.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

Smokestacks.
Plessisville Foundry, Plessisville, Que.
Polson Iron Works, Toronto.

Sockets.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Soldering Irons.
Brown, Boggs & Co., Hamilton, Can.

Solders.
Tallman Brass & Metal Co., Hamilton.

Special Machinery.
Armstrong Bros., Toronto.
W. H. Banfield & Sons, Toronto.
John Bertram & Sons Co., Dundas.
Baird Machine Co., Bridgeport, Conn
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Agency, Montreal.
Cunningham & Sons, St. Catharines, Ont.
Charles F. Elmes Eng. Works, Chicago
Detrick & Harvey Machine Co., Baltimore, Md.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
Jardine, A. B., & Co., Hespeler.
National Mach. & Sup. Co., Hamilton.
Plessisville Foundry, Plessisville, Que.
Smart-Turner Machine Co., Hamilton, Ont.
Wm. Tod Company, Youngstown, O.

Spike Machines.
The Smart-Turner Machine Co., Hamilton.

Spring Coilers.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

Springs, Machinery.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele Ltd., Guelph, Ont.
Wallace, Barnes Co., Bristol, Conn.

Spring Making Machinery (Automatic).
Baird Machine Co., Bridgeport, Conn.

Sprockets, Chain.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

Stairs, Iron.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Stamping.
Duncan Electrical Co., Montreal.

Stamping Machinery.
Homer & Wilson, Hamilton, Ont.
Brown, Boggs & Co., Hamilton, Can.

Stay-Bolt Driver.
Independent Pneumatic Tool Co., Chicago.

Stand Pipes.
Polson Iron Works, Toronto.

Stationary Ladders.
New Britain Machine Co., New Britain, Conn.

Steam Specialties.
Sheldons, Ltd., Galt, Ont.

Steam Separators and Traps.
Can. Fairbanks-Morse Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Steel Alloy.
Vanadium Alloys Steel Co., Pittsburgh, Pa.

Steel Chains for Pulp Mill and Saw Mill.
Plessisville Foundry, Plessisville, Que.

Steel Bench Legs.
New Britain Machine Co., New Britain, Conn.

Steel Bending Brakes.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Steel, Cold Rolled.
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.
Wallace, Barnes Co., Bristol, Conn.

Steel Pressure Blowers.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Steel, all kinds.
Can Bridge Co., Walkerville, Ont.
Lackawanna Steel Co., Lackawanna, N.Y.

Steel, High Speed.
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Ltd., Montreal.
Thos. Firth & Sons, Montreal.
National Mach. & Sup. Co., Hamilton.
Vanadium Alloys Steel Co., Pittsburg, Pa.

Steel Die Engraving.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Steel Vanadium.
Vanadium Alloys Steel Co., Pittsburgh, Pa.

Stocks for Dies.
Wells Bros. Co., Greenfield, Mass.

Stocks, Pipe.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corporation, Greenfield, Mass.

Stools, Steel, Shop.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Stock Racks for Bars, Piping, Etc.
New Britain Machine Co., New Britain, Conn.

Straight Edges.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Straightening Machinery.
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland
National Mach. & Sup. Co., Hamilton.

Structural Steel.
Hamilton Bridge Works Co., Hamilton, Ont.
Lackawanna Steel Co., Lackawanna, N.Y.
Owen Sound Iron Works Co., Owen Sound, Ont.

Studs.
Galt Machine Screw Co., Galt, Ont.
John Morrow Screw Co., Ingersoll, Ont.

Stud Driver.
Keystone Mfg. Co., Buffalo, N.Y.

Switchboards.
Toronto & Hamilton Electric Co., Hamilton.

Switches, Railway.
National Mach. & Sup. Co., Hamilton.

Tachometers.
Brown Instrument Co., Philadelphia, Pa.

Tanks, Oil.
Wayne Oil Tank & Pump Co., Fort Wayne, Ind.

Tanks, Steel.
John Inglis Co., Toronto.
Plessisville Foundry, Plessisville, Que
Polson Iron Works, Toronto.

Tapes, Measuring.
Lufkin Rule Co., Windsor, Ont.
James Chesterman & Co., Ltd., Sheffield, Eng.

Tapes, Friction.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Tapping Machines (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Tapping Machines and Attachments.
Baker Brothers, Toledo, O.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
Girard Machine & Tool Co., Philadelphia, Pa.
Greenfield Tap & Die Corporation, Greenfield, Mass.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
L. S. Starrett Co., Athol, Mass.

Tap Chucks.
Wells Bros., Greenfield, Mass.

Taps, Adjustable.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.

Taps, Dies and Wrenches.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland.
Geometric Tool Co., New Haven, Conn.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wiley & Russell Co., Greenfield, Mass.
Wells Brothers Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Technical Books.
The MacLean Publishing Co., Ltd., Toronto.

Testing Instruments, Metallurgical.
Shore Instrument & Mfg. Co., New York City.

Testing Laboratories.
Toronto Testing Laboratory, Toronto.

Thread Cutting Machines.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Geometric Tool Co., New Haven, Conn.
Girard Machine & Tool Co., Philadelphia, Pa.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
National Machy. Co., Tiffin, Ohio.
Wiley & Russell Co., Greenfield, Mass.

Thread Milling Machines.
Holden-Morgan Co., Toronto.

Thermometers, Indicating and Recording.
Brown Instrument Co., Philadelphia, Pa.

Time Clocks.
International Time Recording Co Toronto.

How Much Is It Worth?

You will find this issue of CANADIAN MACHINERY interesting and instructive. Can you place a dollar-and-cents value on the information it contains? If you can, then multiply it by fifty-two, and if the result is less than one dollar, we have nothing further to suggest. If, however, the result is *more* than one dollar, why not send us your subscription for one year—fifty-two issues?

If you are already a subscriber you will perhaps be able to recommend Canadian Machinery to some friend who isn't. This will help us, it will help your friend, and having done this, it will help you.

FOR YOUR CONVENIENCE

SIGN, TEAR OFF AND MAIL TO-DAY

.....1915.

Canadian Machinery,
143-153 University Ave.,
Toronto.

Gentlemen:—

Please enter my name as a subscriber to your paper for one year, and until ordered discontinued, for which I agree to pay $2.00 on receipt of bill.

Name .....

Address .....

Position .....

Firm .....

Tinsmiths' Tools.
Brown, Boggs & Co., Hamilton, Can
Steel Bending Brake Works, Ltd., Chatham, Ont.

Tire Setting Machines, Hydraulic.
West Tire Setter Co., Rochester, N.Y.

Tire, Wheels.
Wells Bros. Co., Greenfield, Mass.

Toolmakers' Files.
American Swiss File & Tool Co., New York.

Tool Boxes, Steel.
Can. Steel Products Co., Montreal.

Tool Holders.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dunlas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Tool Room Partitions.
Can. Wire & Iron Goods Co., Hamilton.

Tool Posts, Lathe.
Armstrong Bros. Tool Co., Chicago.

Tool Steel.
Armstrong, Whitworth, Ltd., of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Thos. Firth & Sons, Montreal.
National Mach. & Sup. Co., Hamilton.

Tools, Blacksmiths', Etc.
A. R. Williams Machy. Co., Toronto.

Tools, Electrical.
A. R. Williams Machy. Co., Toronto.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
United States Elec. Tool Co., Cincinnati, O.

Tools, Grinding, Milling, Drilling, Etc.
Newton Machine Tool Works, Inc., Philadelphia, Pa.

Tools, Lathe, Planer and Slotter.
Armstrong Bros. Tool Co., Chicago.

Torches, Steel.
Stevens, F. B., Detroit, Mich.
Armstrong, Whitworth of Canada, Ltd., Montreal.

Track Bits.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Track Systems.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co, Harvey, Ill.

Track Tools.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Can. Fairbanks-Morse Co., Montreal.

Transformers and Converters.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Transmission Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Hamilton Gear & Mach. Co., Toronto.
Jones & Glassco, Montreal.
D. K. McLaren, Montreal.
Morse Chain Co., Ithaca, N.Y.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.

Transmission Towers.
Can. Bridge Co., Walkerville, Ont.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

Traveling Cranes.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Trolley Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks, Lumber and Kiln.
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

Trucks, Factory, Freight, Etc.
Chambers, Ltd., Toronto.
Chapman Double Ball Bearing Co., Toronto.
[illegible] Mass.
[illegible]

Tube Expanders (Rollers).
A. R. Jardine & Co., Hespeler.
Watson-Stillman Co., Aldene, N.J.

Tumbling Barrels.
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Turnbuckles.
Canadian Billings & Spencer, Ltd., Welland.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Turret Machines.
Acme Machine Tool Co., Cincinnati, O.
Brown & Sharpe Mfg. Co., Providence, R.I.
W. P. Davis Machine Co., Rochester, N.Y.
Fay & Scott, Dexter, Me.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co. of Chicago, Chicago Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney, Hartford, Conn.
Turner Machine Co., Ltd., Danbury, Conn.
Warner & Swasey, Cleveland, O.

Turbines, Steam, Water.
Plessisville Foundry, Plessisville, Que.

Upsetting and Bending Machinery.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dunlas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. R. Jardine & Co., Hespeler.
National Machy. Co., Tiffin, O.
Niles Bement Pond Co., New York.
Watson Stillman Co., Aldene, N.J.

Vacuum Pumps.
Buffalo Forge Co., Buffalo, N.Y.
Smart-Turner Machine Co., Hamilton, Ont.

Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
New Britain Machine Co., New Britain, Conn.

Valves, Pipe.
Armstrong Mfg. Company, Bridgeport, Conn.
Bignall & Keeler Mach. Works, Edwardsville, Ill
Butterfield & Co., Rock Island, Que
Emmett Mfg. Co., Waynesboro, Pa.
National Mach. & Sup. Co., Hamilton.
J. H. Williams Co., Brooklyn, N.Y.

Vises, Planer and Shaper.
Girard Machine & Tool Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Skinner Chuck Co., New Britain, C.

Vises, Milling Machine.
National Mach. & Sup. Co., Hamilton.

Vises, Woodworking.
Emmett Mfg. Co., Waynesboro, Pa.

Voltmeters.
Brown Instrument Co., Philadelphia, Pa.

Valves, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Watson-Stillman Co., Aldene, N.J.
R. D. Wood & Co., Philadelphia, Pa.

Valve Leathers.
Graton & Knight Mfg. Co., Montreal.

Valves, Back Pressure, Steam.
Sheldons, Limited, Galt.

Vanadium Steel.
H. A. Drury Co., Ltd., Montreal.

Ventilating Apparatus.
Can. Sirocco Co., Ltd., Windsor, Ont.
Pangborn Corporation, Hagerstown, Md.
Sheldons, Limited, Galt.
A. R. Williams Machy. Co., Toronto.

Vises, Bench.
Emmert Mfg. Co., Waynesboro, Pa.
Hollands Mfg. Co., Erie, Pa.
National Mach. & Sup. Co., Hamilton.

Washers.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Wallace, Barnes Co., Bristol, Conn.

Washer Machines.
National Machy. Co., Tiffin, Ohio.

Waterproof Coating, Cement, Fabric.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Watchman's Clocks.
A. R. Williams Machy. Co., Toronto.

Wattmeters.
Brown Instrument Co., Philadelphia, Pa.

Welding and Cutting Clamps.
Can. Blaugas Co., Ltd., Montreal.
L'Air Liquide Society, Toronto.

Welding and Cutting Work.
Can. Blaugas Co., Ltd., Montreal.
L'Air Liquide Society, Toronto.
Metals Welding Co., Cleveland, O.

Welding, Autogenous.
Can. Blaugas Co., Ltd., Montreal.
L'Air Liquide Society, Toronto.

Welding, Acetylene and Oxygen
Can. Blaugas Co., Ltd., Montreal.
L'Air Liquide Society, Toronto.
Metals Welding Co., Cleveland, O.

Welding Machines, Electric, etc
Can. Blaugas Co., Ltd., Montreal.
Tabor Mfg. Co., Philadelphia, Pa.

Wheels, Emery, Carborundum.
Can. Hart Wheels, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Toronto.

Winches.
John H. Hall & Sons, Brantford.
Northern Crane Works, Walkerville.

Window Wire Guards.
Canada Wire & Iron Goods Co., Hamilton.

Wire Cloth and Perforated Metals.
Canada Wire & Iron Goods Co., Hamilton.
Dennis Wire & Iron Works Co., Ltd. London.

Wire Forms.
Wallace, Barnes Co., Bristol, Conn.

Wire Forming and Stamping Machinery
Brown, Boggs Co., Ltd., Hamilton Canada.
F. B. Shuster Co., New Haven, Conn.
Baird Machine Co., Bridgeport, Conn.

Wire Guards and Railings.
Canada Wire & Iron Goods Co Hamilton, Ont.

Wire Nails.
Parmenter & Bulloch Co., Gananoque.

Wire Nail Machinery.
National Machy. Co., Tiffin, Ohio.
A. R. Williams Machy. Co., Toronto

Wire, Spring.
Wallace, Barnes Co., Bristol Conn.

Wire Straighteners and Cutters.
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton Canada.
F. B. Shuster Co., New Haven, Conn.

Wire Coiling and Pointing Machines.
Baird Machine Co., Bridgeport, Conn
F. B. Shuster Co., New Haven, Conn.

Wood Boring Machines.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
Independent Pneumatic Tool Co Chicago, Ill.

Woodworking Machinery.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Plessisville Foundry, Plessisville, Que.
A. R Williams Machy. Co., Toronto.

Wrenches.
Armstrong Bros. Tool Co., Chicago, Ill
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros Co., Greenfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn N.Y.

Wrenches, Automobile Narrow Jaw and Monkey.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Trimont Mfg Co., Roxbury, Mass.

Wrenches, Pipe, Monkey.
Bemis & Call Hardware & Tool Co Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Ratchet and Basin.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Trimont Mfg Co., Roxbury, Mass.

WHEN you need new equipment or supplies for your machine shop

Consult this Directory

¶ You'll find listed here the reliable makers of the lines you need; firms who believe in the progressiveness of present-day manufacturers and who appeal to their intelligence through their own engineering journal.

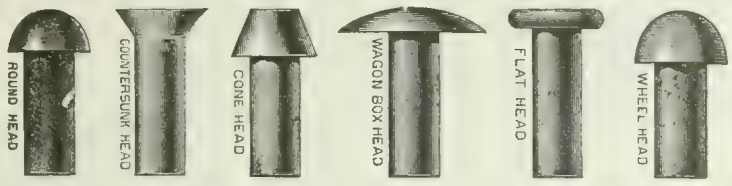
¶ Consult Canadian Machinery Buyers' Directory and you can't go wrong in your buying.

AUTOMATIC
WOOD SCREW MACHINES

Cable Address:
Cook, Hartford, U.S.A.

Asa S. Cook Co.

Hartford,
Conn.



WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller.

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

NORTHERN CRANE WORKS, Limited
WALKERVILLE, ONT.
BUY IN CANADA!

NORTHERN CRANES

ELECTRIC AND HAND POWER
ALL SIZES, CAPACITIES AND TYPES
ALSO ELECTRIC AND AIR HOISTS
Foundry Equipment—Cupolas, Ladles, Etc.

SMOOTH-ON
TRADE MARK—REG. U.S. PAT. OFF.

Iron Cements

Positively stop all leaks of steam, water, fire or oil, in iron, steel or concrete. They are easy to apply, harden quickly and make permanent repairs, proved by years in use.

Every engineer should have a copy of our instruction book.

Smooth-On Mfg. Company
Jersey City, N. J., U. S. A.

Send for New
No. 15 Illustrated Instruction Book

M·A HANNA & Co.

FROM
PORT COLBORNE

"Victoria"
PIG IRON

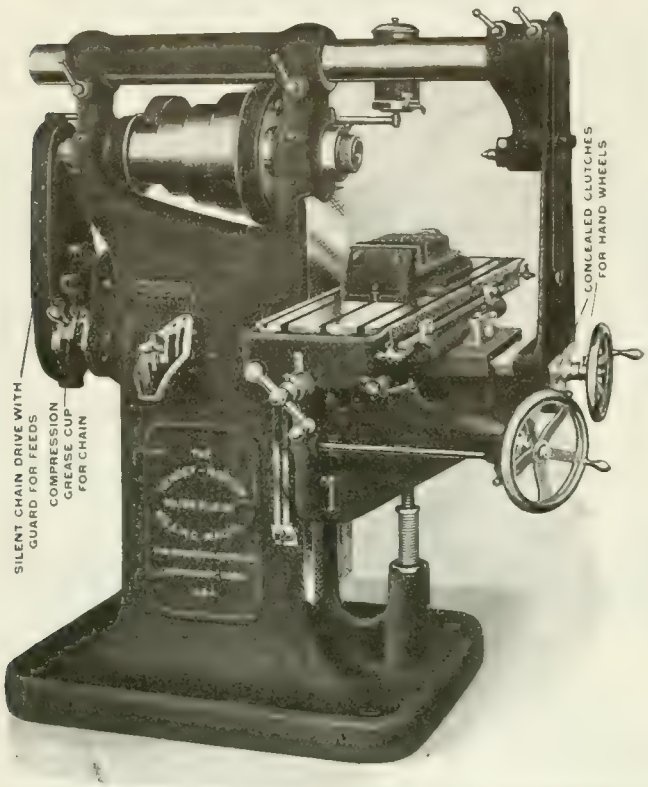
Foundry
Soft and Strong
Malleable

Shipments from
The Canadian Furnace Co.

M. A. HANNA & CO.
Sales Agents Cleveland

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Hendey Millers will take any kind of a miller job



that comes in to the modern shop

and it delivers the finished work in the highest degree of accuracy and perfection. It has a wide range of spindle speeds (16) and feeds (18).

The **"Hendey"** is free from the usual complicated features. All working positions are secured with but **few and easily understood movements** on the part of the operator. **Anyone can operate the "Hendey Miller."** No special skill is required to get the service that the Hendey's built for.

Write for the "Hendey Miller" Book. It is certain to interest you.

The Hendey Machine Co.

Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.

INDEX TO ADVERTISERS

Allen Mfg. Co., Inc. 77
American Pulley Co. 32
Armstrong Bros. Tool Co. 23
Armstrong Mfg. Co. 76

Band Machine Co. 79
Banfield, W. H. & Sons 74
Barnes & Co., W. F. & Sons 79
Barnes & Call Hardware & Tool Co. 2
Bertram's, Limited 71
Bignell & Keeler Machine Works 12
Blake & Johnson Co. 24
Bliss, E. W. Co. 27
Bland, J. G. Co. 7
Brown, Boggs Co. 8
Brown & Sharpe Mfg. Co. 81
Butterfield & Co. ..... Outside back cover

Canada Machinery Agency 78
Canadian Billings & Spencer 22
Can. Boomer & Boschert Press Co. 4
Can. Bridge Co. 76
Can. Buffalo Forge Co. 7
Can. Drawn Steel Co. 77
Can. Economic Lubricant Co. 36
Can. Fairbanks-Morse Co. 8
Can. H. W. Johns-Manville Co. 7
Can. Hoeken Co. 4
Can. Ingersoll Rand Co. 3
Can. Locomotive Co. 90
Can. Sirocco Co. 9
Carborundum Co. 10
Cataract Refining Co. 16
Chapman Double Ball Bearing Co. 6
Christensen, Jas., & Co., Ltd. 89
Cincinnati Milling Machine Co. 13
Cleveland Pneumatic Tool Co. of Canada 11
Cleveland Twist Drill Co. 85
Consolidated Wire Spring Co. 73
Consumers' Oil Co. 80
Coon Co., Asa S. 95
Crane Wm. & Son, Steel & Engine Bldg. Co. 15
Cunningham & Son 71
Curtis Pneumatic Machy. Co. 34
Cushman Chuck Co. 24

Delta File Works 73
Dennis Wire & Iron Works 70
Dennison, H. J. S. 89
Diamond Saw & Stamping Works 24
Dominion Belting Co., Ltd. 73
Dominion Bridge Co. 26
Dom. Stamping Co. 70
Duncan Electrical Co. 71

Eastern Machinery Co. 73
Elmes Eng. Works, Charles F. 27
Emmert Mfg. Co. 77
Etablissement Astra 72

Fay & Scott 25
Fetherstonhaugh & Co. 89
Firth & Son Ltd., Thos. 1
Fleck, Alexander, Limited 89
Foster, W. L. 26
Foundry & Machine Exhibition Co. 91
Fox Machine Co. 16

Gait Malleable Iron Co. 75
Gardner Machine Co. 77
Gardner, Robt., & Son 75
Garvin Machine Co. 77
Geometric Tool Co. 63
Girard Machine & Tool Co. 72
Gorton, Geo., Machine Co. 71
Grant Mfg. & Machine Co. 15
Greenfield Machine Co. 20
Guelph Pattern Works 71

Hall & Sons, J. H. 17
Hamilton Bridge Works Co. 35
Hamilton Gear & Machine Co. 36
Hamilton Pattern & Foundry Co. 71
Hanna & Co., M. A. 95
Hendey Machine Co. 96
High Speed Hammer Co. 85
Hollands Mfg. Co. 74
House & Co., Fredk. 71
Hoyt Metal Co. 75
Hunter Saw & Machine Co. 21

International Malleable Iron Co. 30
International Time Recording Co. 65

Jacobs Mfg. Co. 79
Jardine, A. B., Co. 27
Jenckes Machine Co. 75
Jones & Glassco 37

Kempsmith Mfg. Co. 11
Ker & Goodwin 74
Keystone Mfg. Co. 22

Lackawanna Steel Co. 94
Landis Machine Co. 3
Landis Tool Co. 10
London Bolt & Hinge Co. 74
Long & Alstatter Co. 11
Lufkin Rule Co. of Canada 36
Lymburner, Ltd. 25

Magnolia Metal Co. 32
Main Belting Co. 83
Marion & Marion 89
McDougall Co., R. ..... Inside back cover
McLaren, J. C., Belting Co. 76
Modern Tool Co. 7
Morse Chain Co. 33
Morse Twist Drill & Machine Co. 85
Morton Mfg. Co. 71
Motch & Merryweather 14
Muir, Wm., & Co. 71
Murchey Machine & Tool Co. 69

National Machinery & Supply Co. 23
National Machinery Co. 75
New York Machinery Exchange 87
Nicholson File Co. 87
Niles-Bement-Pond ..... Inside front cover
Noble & Westbrook Mfg. Co. 78
Northern Crane Works 95
Norton, A. O. 79
Norton Co. 6
Nova Scotia Steel & Coal Co., Ltd. 30

Oven Equipment & Mfg. Co. 28
Owen Sound Iron Works 74

Parmenter & Bulloch Co. 95
Perrin, Wm. R. 77
Philadelphia Gear Works 78
Plessisville Foundry 79
Positive Clutch & Pulley Works 79
Pratt & Whitney ..... Inside front cover
Puro Sanitary Drinking Fountain Co. 68

Root Co., C. J. 79
Ross-Thompson & Co. 89
Rumely-Wachs Machinery Co. 68

Sheldons, Limited 94
Shelton Metallic Filler Co. 31
Shinn, M. E., & Co. 80
Shore Inst. & Mfg. Co. 79
Shuster Co., F. B. 78
Skinner Chuck Co. 78
Smart-Turner Machine Co. 78
Smooth-On Mfg. Co. 95
Southwark Foundry & Machine Co. 5
Starrett Co., L. S. 18
Steele, Ltd., James 71
Stirk & Sons, John 71
Stow Mfg. Co. 85

Tabor Mfg. Co. 78
Tallman Brass & Metal Co. 36
Thwing Instrument Co. 77
Tod, Wm., Co. 9
Toledo Machine & Tool Co. 27
Toronto & Hamilton Electric Co. 76
Toronto Pattern Works 71
Tremont Mfg. Co. 17
Turner Machine Co. 80

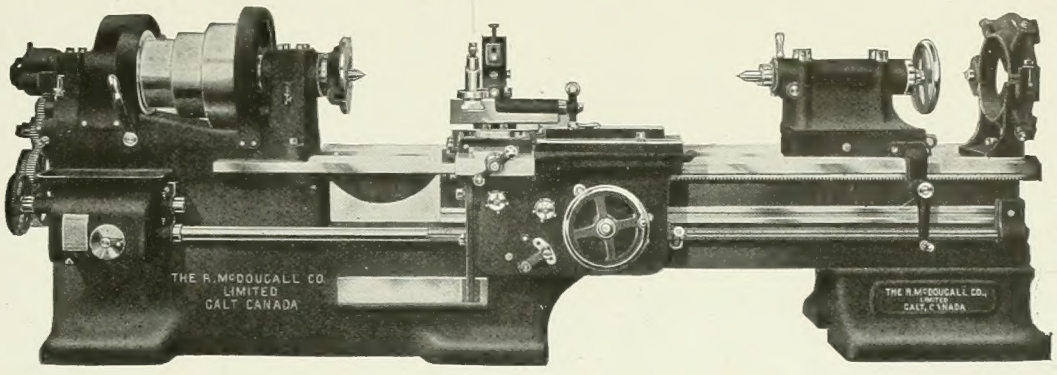
Union Drawn Steel Co. 76
United States Electric Tool Co. 25

Wallace Barnes Co. 23
Warner & Swasey Co. 76
Welland Machine & Foundries, Ltd. 61
Wells Bros. Co. of Canada ..... Inside back cover
West Tire Setter Co. 25
White Machinery Co., A. D. 68
Whiting Foundry Equipment Co. 34
Whiton Machine Co., D. E. 79
Williams, J. H., Co. 19
Williams Machinery Co., A. R. 63
Williams Tool Co. 12
Windsor Machine Co. 3

McDougall Gap Lathes

—

Strength
Accuracy
Quality



Take a look at the next money you intend to invest in a Lathe.
Then, take a look at the money's worth we offer you in our machine.
Your money will soon come back to you in increased production and we will have the pleasure of having a satisfied user. Our machines are just as good as they look and they look good too.
We invite the closest inspection.

ARE-MAC-DEE IS A GUARANTEE

Particulars on request.

The R. McDougall Company Limited

Manufacturers
GALT, Ont., Canada
The Canadian Fairbanks-Morse Co., Limited, Sales Agents.

Little Giant

CYLINDRICAL LIMIT GAGES

For shell work this style of gage is most efficient and economical.

PROMPT SHIPMENT.

We maintain a large stock at all times.

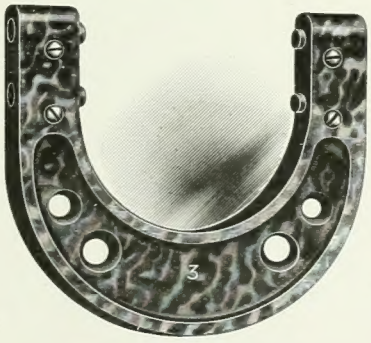
These can be shipped set to special limits specified by the customer within **48 hours** from receipt of order.

Gages set to special limits and with setting plugs can be shipped in 7 to 10 days.

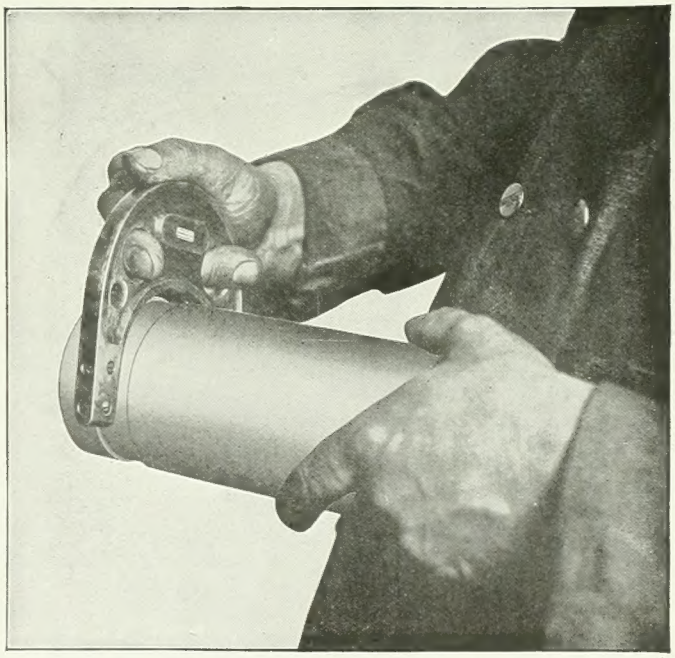
THREAD LIMIT GAGES.

For every form and style of screw thread.

Send for our Gage Catalog.



The upper points are set in maximum limits — the lower points to minimum limits. Points can be sealed to prevent tampering.



Wells Brothers Company of Canada, Limited

GALT, ONT.

Sales Agents:
The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

Butterfield Taps

USED ON SHELLS or any other job they produce more work in a given time and last longer.

This claim is based on results of exhaustive working tests against other makes.

Positively guaranteed. The sooner you send for a trial order, the sooner you'll get next to a better tool.

BUTTERFIELD & CO., INC.

Rock Island, Quebec — Derby Line, Vermont

Eclipse all others in results

Canadian Made